FACTORY

MANAGEMENT AND MAINTENANCE

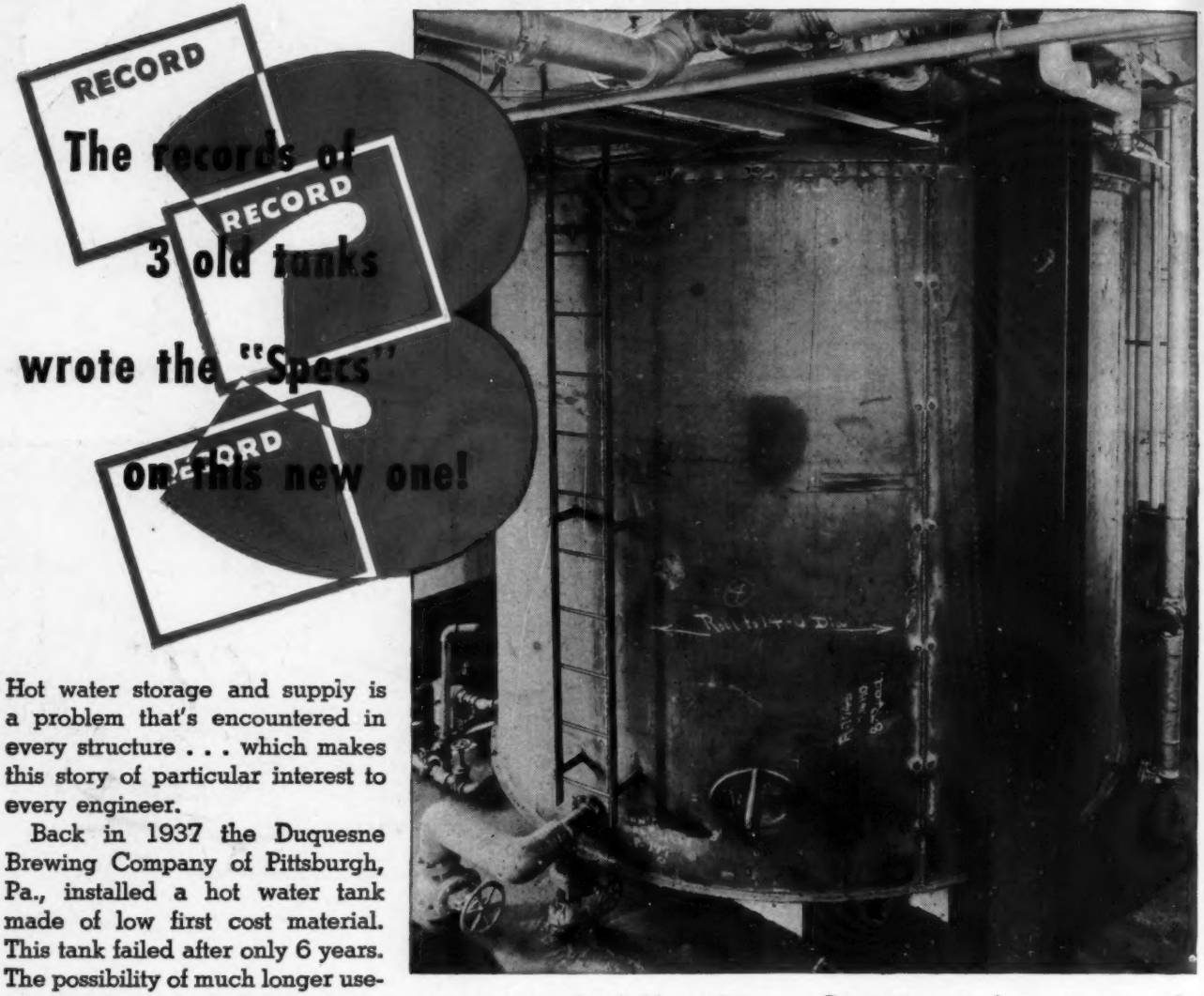
A McGRAW-HILL PUBLICATION

JANUARY 1944

Capital Goods for Raw Materials?—page 8

PER 44

BYERS WROUGHT IRON



Hot water storage and supply is a problem that's encountered in every structure . . . which makes this story of particular interest to every engineer.

Back in 1937 the Duquesne Brewing Company of Pittsburgh, Pa., installed a hot water tank made of low first cost material. This tank failed after only 6 years. The possibility of much longer useful life from wrought iron was suggested by the fact that two wrought iron tanks, also built in 1937 for severe corrosive service, were still on the job. After investigation, the engineers built the new hot water tank of Byers Wrought Iron. The company is also installing wrought iron for all piping in new construction and for maintenance, and has used several thousand pounds in hoops for wooden tanks.

Water varies so widely in its corrosive characteristics that the only safe guide in specification is actual experience under field conditions. Even though you may not have personal knowledge of the performance of wrought iron in any specific application, you can still make your selection on this basis, for our Engineering Service Department will give you service records received from other engineers.

The excellent results obtained from wrought iron in corrosive services stem directly from its two-component structure. Tiny fibers of glass-like silica slag are threaded through the high-purity iron matrix. Corrosive attack is continuously retarded and diffused. In addition, the initial protective film is firmly anchored in place, which helps to shield the underlying metal.

You will find some interesting and helpful information in our bulletin, "Wrought Iron for Tank Construction." May we send you a copy?

A. M. Byers Company. Established 1864. Offices in Pittsburgh, Boston, New York, Philadelphia, Washington, Chicago, St. Louis, Houston, Seattle, San Francisco.

Corrosion costs you more than Wrought Iron

BYERS
GENUINE WROUGHT IRON
TUBULAR AND HOT ROLLED PRODUCTS
ELECTRIC FURNACE ALLOY STEELS • OPEN HEARTH ALLOY STEELS
CARBON STEEL TUBULAR PRODUCTS

SCRAP needed! Iron ore shortage may cut steel production unless MORE scrap fills the gap. Current collections aren't enough. It is everybody's business. Please help.

Every 33 seconds — a lifetime sugar ration

A typical example of B. F. Goodrich improvement in rubber

IT TAKES that big conveyor only 33 seconds to get all the sugar you'll probably use for life — 7,000 pounds — from ship to shore. This is the new and better way to load and unload sugar — time is saved, ships are released sooner.

But in order to let the conveyor system move up and down, in and out — to cover the entire ship load — the belts had to be telescoped one over the other, and telescoped belts meant there was only room enough for 14-inch pulleys. An ordinary conveyor belt heavy enough to do the job would soon be ruined if used on pulleys that small. Some kind of belt was needed that would be very flexible but still strong enough to carry the heavy loads of sugar month after month.

B. F. Goodrich had developed a belt made of cords, running parallel and held in place only by the rubber, not woven together as in ordinary belts. It had been designed to stand heavy falling rocks; the cords could spread apart under the shock and give the effect of more cushion. But it was flexible and strong enough to be used with fewer plies. This new kind of belt was tried on the small pulleys. It travelled around them easily, has helped make this modern loading method a success.

B. F. Goodrich engineers have developed scores of different types of conveyor belts to meet special conditions, and to give longer life and better service on standard installations, too. Don't be satisfied that any rubber product you have is the best you can find, until you have seen whether B. F. Goodrich has developed an improvement over it. *The B. F. Goodrich Company, Industrial Products Division, Akron, Ohio.*

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RUBBER and SYNTHETIC products

Ryerson now interprets modified Jominy Test results in terms of quenched and drawn physical properties for 1, 2, 3, and 4-inch round alloy steel bars.

New Data on Alloy Physicals

Ryerson furnishes hardenability interpretations with each alloy steel shipment

The new Ryerson Alloy Steel Report sheet is furnished with each shipment of alloy steels from stock. This report includes: a positive identification for the steel you receive . . . its chemical analysis as reported by the mill . . . the recommended working temperatures of the steel . . . a chart of its hardenability response with interpretations of the physical properties *after* heat treatment and the effect of mass on the physicals of 1, 2, 3, and 4-inch bars.

All this information makes it easier for you to specify your alloy steel requirements in terms of *what the steel will do* . . . rather than on analysis alone. It further guides you in the proper heat treatment of your steel to obtain the best results.

Ryerson engineers and metallurgists will gladly assist you in any problem of steel selection, application or fabrication. Investigate this helpful service next time you need steel from stock.

Joseph T. Ryerson & Son, Inc., Chicago, Milwaukee, St. Louis, Detroit, Cleveland, Cincinnati, Buffalo, Boston, Philadelphia, Jersey City.

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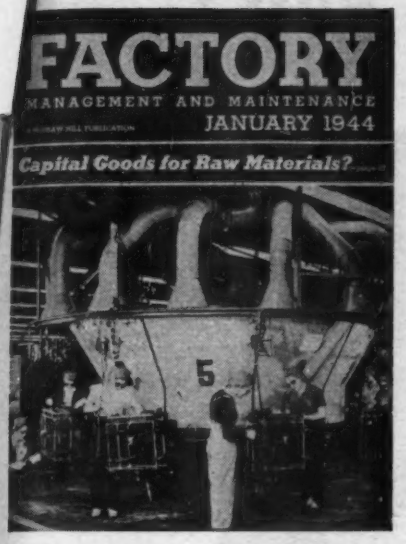

Merry-go-round conveyor speeds fabrication of frames for radio sets at General Electric's Schenectady plant. It makes a revolution in 25 minutes, allowing ample time for work at the ten stations——one for loading and unloading, one for set-up and fluxing, eight for brazing. Fixtures are trunnion-mounted so assemblies can be turned end for end.

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FACTORY

MANAGEMENT AND MAINTENANCE

JANUARY · 1944

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NO TIME FOR "BROKEN NOSES" NOW!

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That's a big bomber nose in the corrugated box. It's a mighty important piece of war goods, and its safe delivery stresses the vital role, war-time packaging is playing. Yes, on the unbroken chain of production, packaging and safe arrival depends the welfare of our armed forces.

Techniques developed in the engineering of war-time packages, that carry every type of war supplies to world-wide destinations, are carefully studied by H & D Package Engineers so that every possible packaging improvement will be in readiness for your post-war requirements.

Tomorrow's shipments will profit by today's packaging developments. Now is the time to plan post-war packaging. Rugged, dependable H & D corrugated boxes, designed by the authority on packaging, are the answer to shipshape, undamaged deliveries. Let H & D Package Engineers help you with your plans for post-war packages that protect and promote the product.

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This booklet as well as the 7 others that comprise the H & D "Little Packaging Library" can be had by writing The Hinde & Dauch Paper Company, Executive Offices, 4447 Decatur Street, Sandusky, Ohio.

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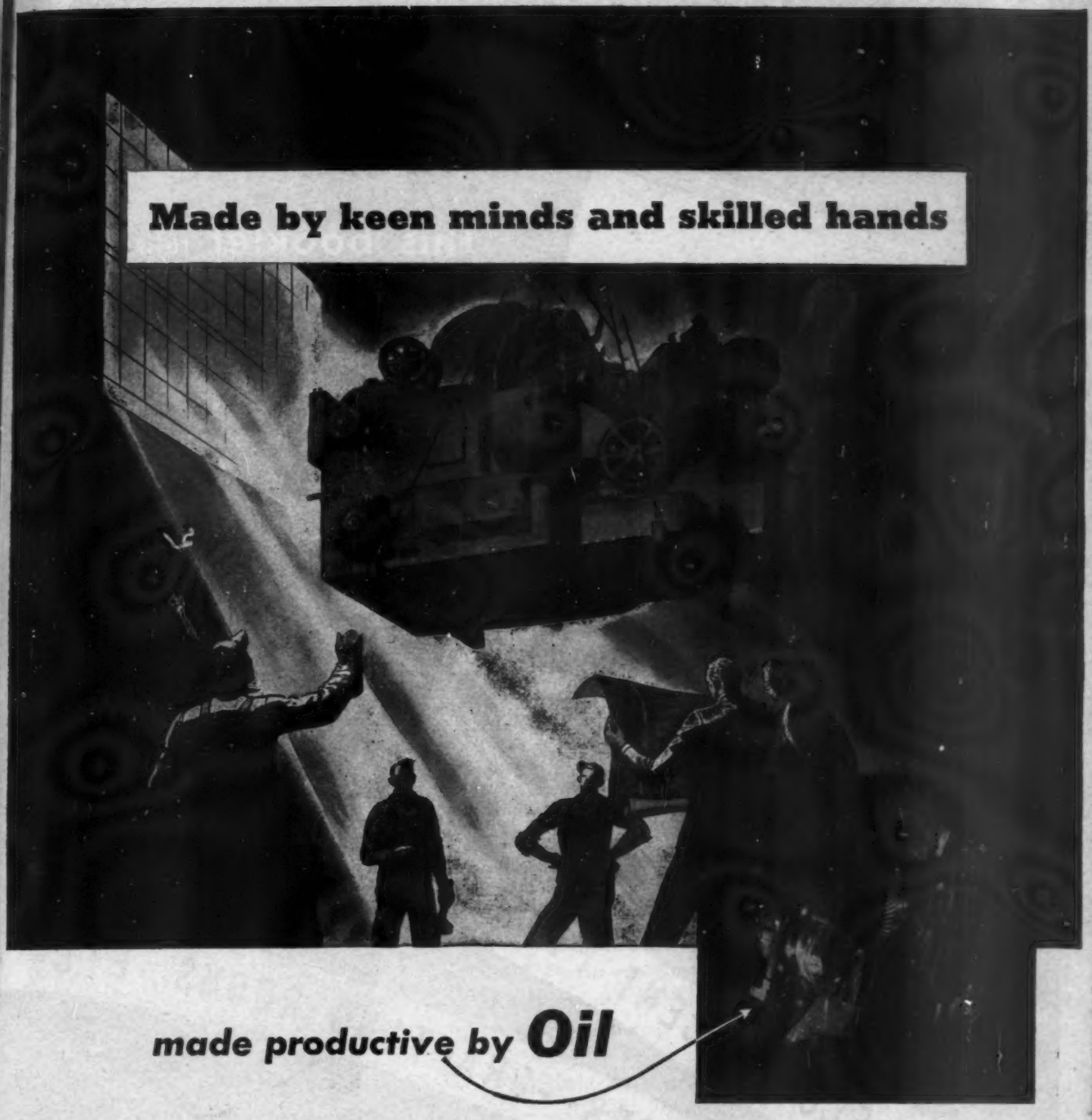
For postwar packaging . . better see **HINDE & DAUCH**

AUTHORITY ON PACKAGING . . . CORRUGATED SHIPPING BOXES



Machines tools—the master tools of production for war—are triumphs of engineering and manufacturing skill. The ruggedness and precision built into machine tools today afford ample evidence that machine tool manufacturers have made an irreplaceable contribution to the war effort.

Without oil, however, these fine precision machines would be non-productive. For lubricants are necessary to protect the accurately made parts . . . cutting oils to protect the tools, and to make possible fast production and fine finishes on the work . . . and hydraulic oils to actuate many types.

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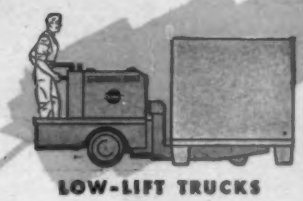
Here's real help for any plant or warehouse faced with transportation problems. The Baker Electric Truck Catalog No. 52 is more than a catalog. It is a handbook of information on material handling with power trucks, designed to facilitate selection of the proper equipment for any set of requirements. In addition to describing the 47 standard Baker Electric Trucks, it covers many special models designed for unusual handling operations.

Actual case histories featured throughout the book show Baker Trucks of all types speeding production, saving time and money and conserving man-power in a wide variety of installations. You are almost sure to find problems comparable to those in your plant, and you can profit from the experience of others in solving them.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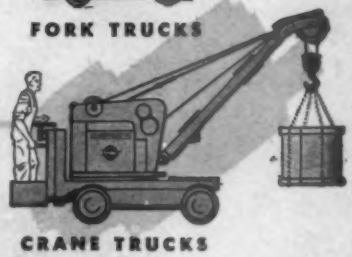
FORK TRUCKS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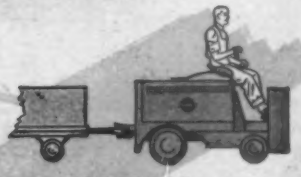
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PLATFORM TRUCKS

Plant and production managers, traffic managers, superintendents, purchasing agents and any others concerned with material handling will find this book a valuable source of information. Write for your copy of The Baker Electric Truck Catalog No. 52 today.

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Baker INDUSTRIAL TRUCKS

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ng thread gauge laps on
narch Sensitive Preci-
Toolmaker's Lathe, in
ge precision gauge plant.

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Monarch's assignment for 1941 was more than double any previous year's production of tool and gauge maker's lathes. On November 11th, 1941, we got a Navy "E" award for more than fulfilling our assignment.

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2 Positive action assures full productive capacity of the machine . . . more pieces per hour.

3 Uniform speed means product quality maintained.

4 Requires no adjustment to maintain tension . . . runs slack . . . less wear . . . less time out.

5 Can be installed quickly and easily, without dismantling bearings or parts of the machine. To install, just slip the chain over the wheels, insert and secure the pin.

6 Unaffected by moisture, temperature or oil. It suffers no deterioration when idle.

7 It's low in first cost (often lower than V-belts), and the most important cost, the total cost per year of efficient service is always less.

8 Runs at full efficiency year after year, often up to 20 years and over, without attention or maintenance other than periodic oiling.

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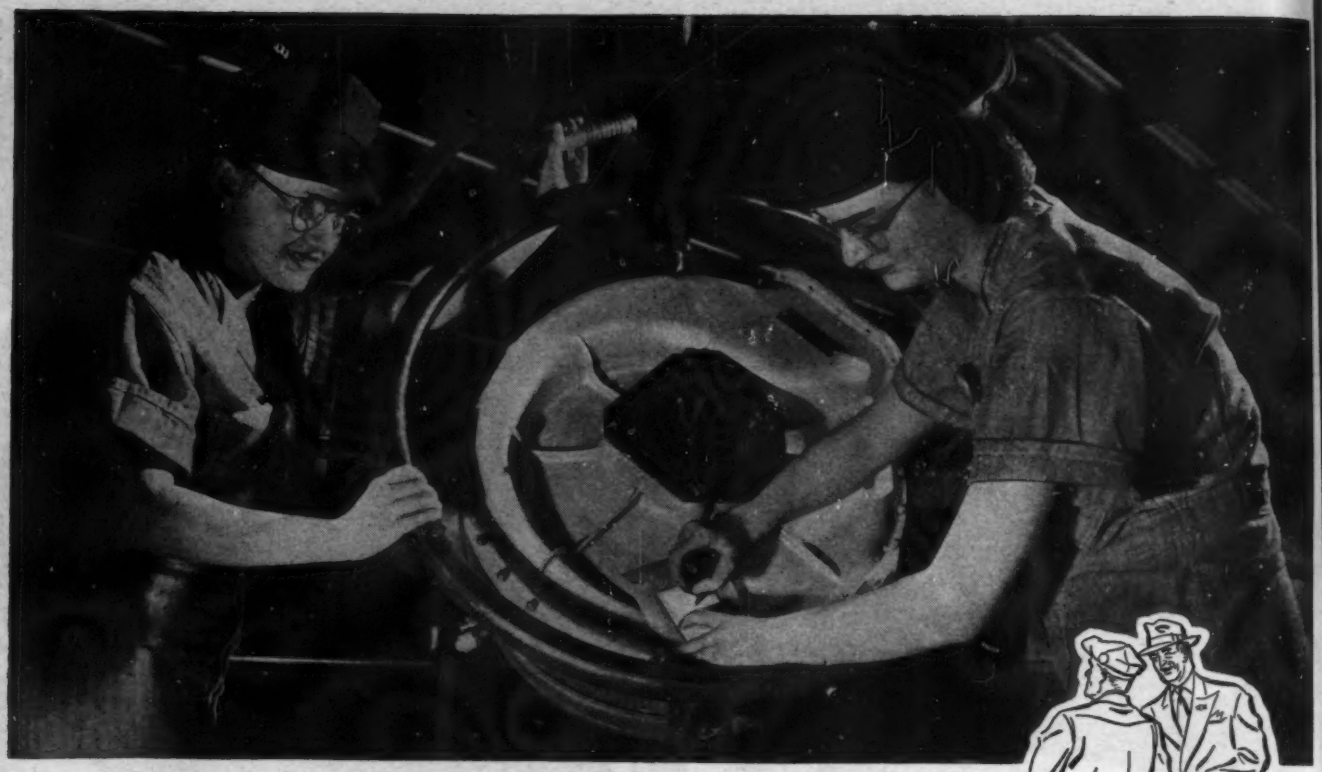

"YOU KNOW HOW WOMEN ARE"

Modine Unit Heaters are made in the Horizontal (as shown above) and Vertical Delivery Models.

"Didn't I ever tell you how come the Old Man put 'em in. Well, it was early in the Fall, when one mornin' the Old Man comes through the plant.

" 'A bit chilly 'round the edges,' says he, lookin' over towards where the women are workin'. 'Not that you or me would even notice it,' he goes on, 'but you know how women are.'

"Well, says I, if they'd wear more clothes . . .

" 'That ain't the point,' the Old Man says. 'They're used to bein' around where it's warm and comfortable. They notice the difference here in the plant. They're more sensitive . . . '

"If they're that fragile, I says, when winter comes they'll all be ketchin' colds . . . or fixin' to get pneumonia . . . and havin' to stay home from work. Then how am I goin' to . . .

" 'I've thought of all that,' the Old Man comes back. 'And we're going to do our best to keep 'em healthy and happy, as well as comfortable—we're puttin' in Modine Unit Heaters.' The Old Man never misses the boat."

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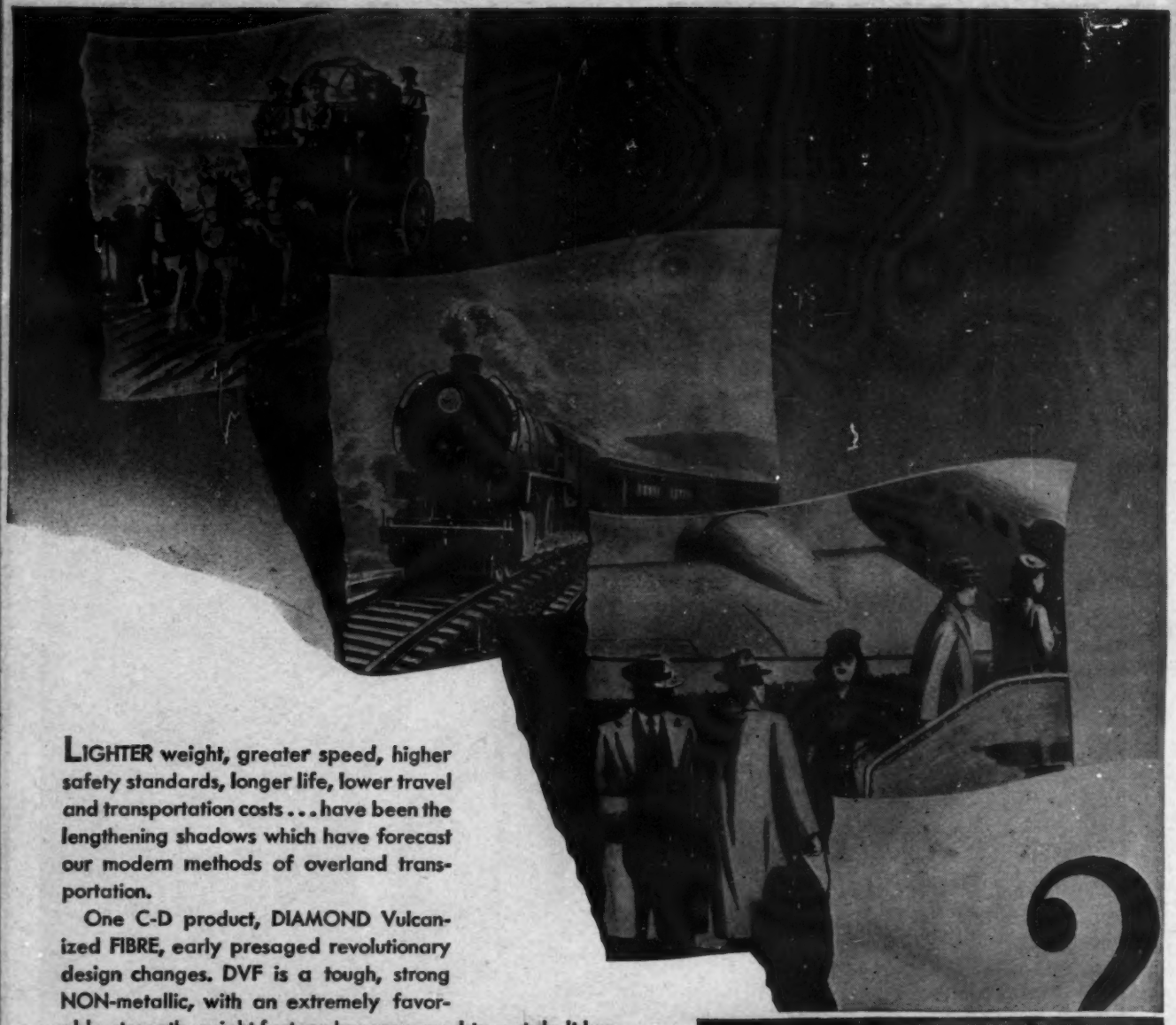

LIGHTER weight, greater speed, higher safety standards, longer life, lower travel and transportation costs . . . have been the lengthening shadows which have forecast our modern methods of overland transportation.

One C-D product, DIAMOND Vulcanized FIBRE, early presaged revolutionary design changes. DVF is a tough, strong NON-metallic, with an extremely favorable, strength-weight factor when compared to metals. It has a natural resilience and great ability to absorb shocks and vibration. It is a good electrical insulator. It is readily punched, machined or formed.

In 1911 C-D introduced DILECTO, a laminated plastic, first called "waterproof fibre." DILECTO has played an equally important part in helping advance transportation methods. Wherever electricity must be controlled C-D DILECTO provides insulation that stands up under extreme conditions of temperature and moisture.

In adapting these and the other C-D NON-metallics to the "What Material?" problems of peace and war, the C-D laboratory has acquired a wealth of "know how" which is at your disposal to help you solve your "What Material?" problem.

DISTRICT OFFICES: New York - Cleveland - Chicago - Spartanburg, S. C. West Coast Rep., Marwood, Ltd., San Francisco - Sales Offices in principal cities

C-D products include THE PLASTICS . . . DILECTO—a laminated phenolic; CELORON—a molded phenolic; DILECTENE—a pure resin plastic especially suited to U-H-F insulation . . . THE NON-METALLICS, DIAMOND Vulcanized Fibre; VULCOID—resin impregnated vulcanized fibre; and MICABOND—built-up mica insulation. Folder GF describes all these products and gives standard sizes and specifications.

C3-43

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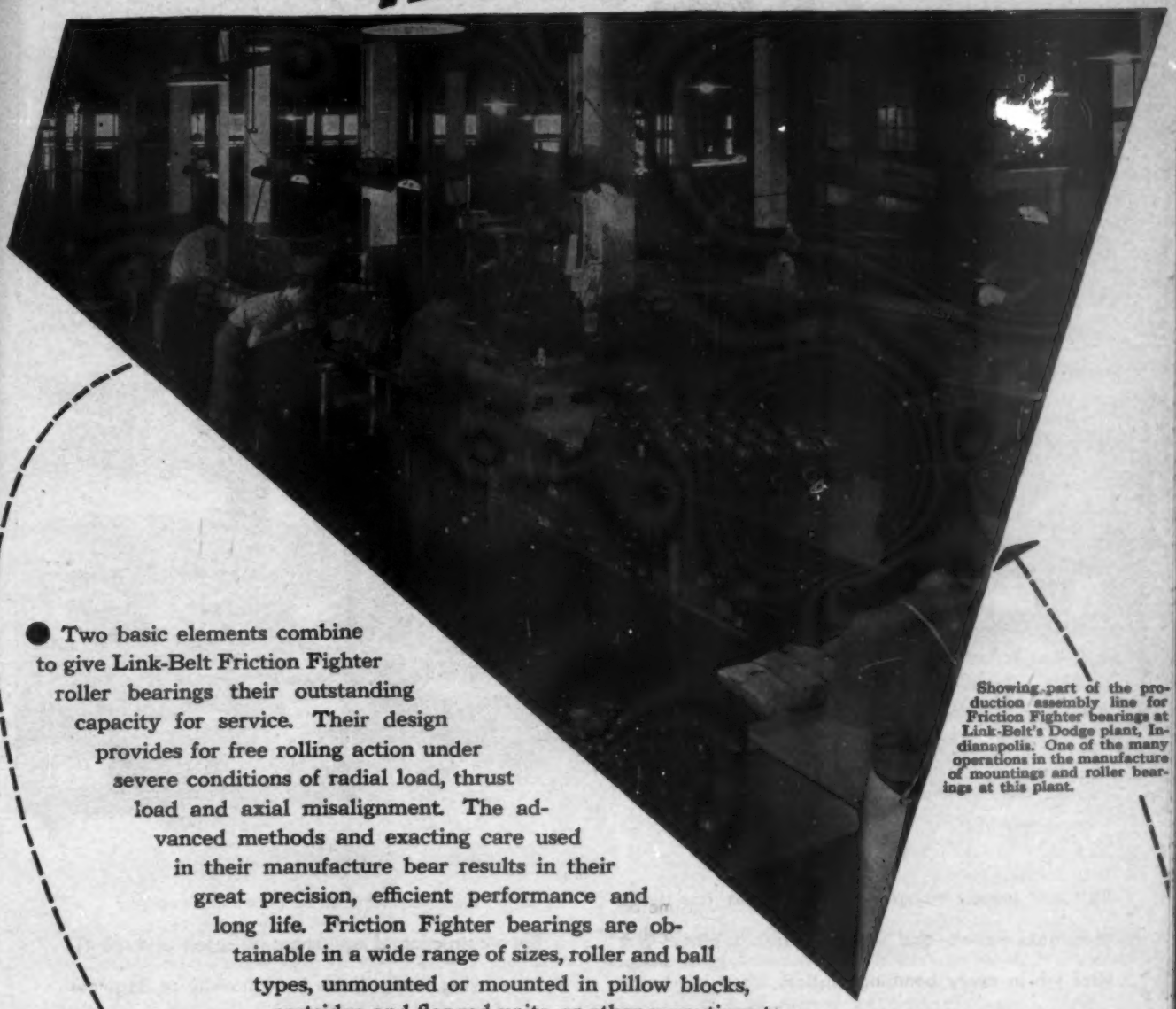
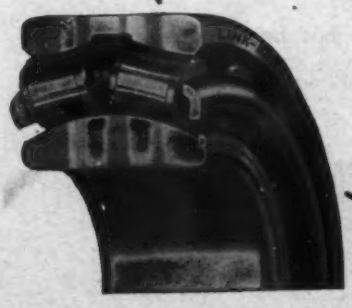
Established 1895 . . Manufacturers of Laminated Plastics since 1911 — NEWARK • DELAWARE

UNIQUE DESIGN *Plus* PRECISION MANUFACTURE



Showing part of the production assembly line for Friction Fighter bearings at Link-Belt's Dodge plant, Indianapolis. One of the many operations in the manufacture of mountings and roller bearings at this plant.

● Two basic elements combine to give Link-Belt Friction Fighter roller bearings their outstanding capacity for service. Their design provides for free rolling action under severe conditions of radial load, thrust load and axial misalignment. The advanced methods and exacting care used in their manufacture bear results in their great precision, efficient performance and long life. Friction Fighter bearings are obtainable in a wide range of sizes, roller and ball types, unmounted or mounted in pillow blocks, cartridge and flanged units, or other mountings to suit all conditions of service. Complete description and full engineering data are contained in Book 1775. Write for a copy today. Link-Belt Company, Indianapolis 6, Chicago 9, Philadelphia 40, Atlanta, Dallas 1, San Francisco 24, Toronto 8. Offices, warehouses and distributors in principal cities.



Friction Fighter Series "DE" roller bearings, illustrated, are self-contained and are properly adjusted at the factory, requiring no further adjustment at installation. Their inherent self-aligning and pre-adjustment features make it unnecessary to resort to the use of undesirable, expensive, or cumbersome self-aligning housings. The "self-contained" feature also permits the bearing to be floated axially in the housing to compensate for shaft expansion.

LINK-BELT

FRICTION FIGHTER

BEARINGS

Roller and Ball Types

Tonight we bomb Berlin

Safe and speedy transportation of bombs from dump to magazine area—and magazine area to plane—is a vital job in every bombing mission. It's a job being carried out today by the bomb trailers designed and built by Saginaw Products Corporation. Saginaw Bomb Trailers carry tons of treacherous T.N.T. safely—oftentimes over bumpy roads. They don't bounce at the rough spots, jack-knife when reversed or sway when speeding along at 40 miles per hour. At Allied airfields in England, Italy, Sicily, Africa, Alaska and the Pacific, Saginaw trailers are doing an efficient job, helping to speed the destruction of the enemy.

But construction of equipment for safely and speedily conveying heavy loads is no novelty to Saginaw Products Corporation. Ever since material handling became a vital phase of industrial production, Saginaw conveying equipment has been employed by many of America's largest manufacturers to keep things moving.

When you are planning the installation of mobile conveying equipment for your plant, it will pay you to consult the Saginaw Products engineers.

SAGINAW PRODUCTS CORPORATION

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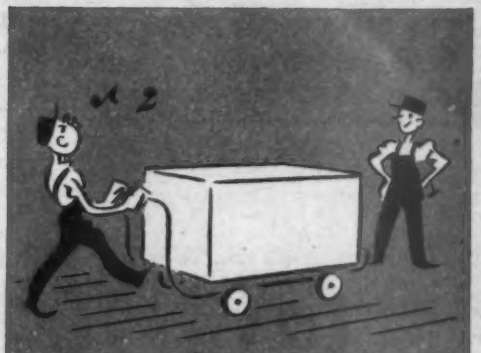
(FORMERLY SAGINAW STAMPING AND TOOL CO.) SAGINAW, MICHIGAN

FIGHT FRICTION!

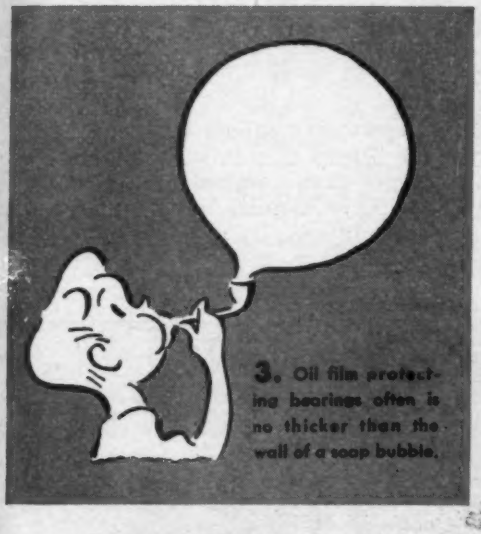
It's Electric Motor Enemy No. 4...

In Allis-Chalmers' new "Guide to Wartime Care of Electric Motors".

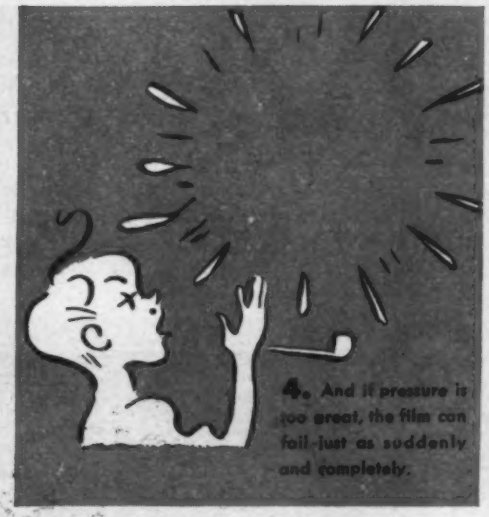
1. Like a motor without oil. Simple! Yet every day hundreds of workers overlook the importance of adequate motor lubrication.



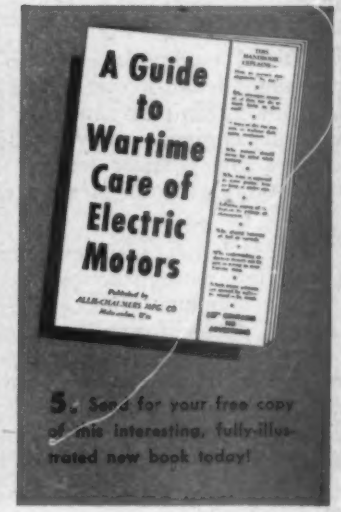
2. Like a motor with oil. Pictures like these make motor maintenance easy to put across in training new employees.



3. Oil film protecting bearings often is no thicker than the wall of a soap bubble.



4. And if pressure is too great, the film can fail—just as suddenly and completely.



5. Send for your free copy of this interesting, fully-illustrated new book today!

ONE OF A MOTOR'S most dangerous enemies is friction. In peacetime, instructions for guarding against it were based on 8-hour-day, 6-day-week operation. Today, with motors working up to *3 and 4 times* as many hours a week, those instructions are dangerously obsolete!

To help put U. S. motor maintenance on an efficient wartime footing, Allis-Chalmers has published "Guide to Wartime Care of Electric Motors". This valuable book explains the *9 main enemies* of electric motors . . . tells you how to fight them. Its recommendations are simple and practical . . . ideal for training new men or as a review for experienced men. Book is fully illustrated with stimulating, understandable sketches like those shown above—*contains no advertising.* Over 100,000 copies in use by industry and armed forces. Send for your *free* copy today! ALLIS-CHALMERS MFG. CO., MILWAUKEE 1, WIS.

A 1658

ALLIS-CHALMERS MOTORS

When you do need new motors, look into the strength, solidity and all-around protection of the new "Safety Circle"—protected top, sides, ends and bottom.

A-C WE WORK FOR VICTORY WE PLAN FOR PEACE

What's Ahead?

No. 1 in a Series

Experts are working experimentally on a universal sign language for use during the period of reconstruction following the war. It has a vocabulary of about two thousand words and can be learned in about a month.

★

Reshingling of homes may be entirely eliminated after the war. With plentiful cheap aluminum as one of the benefits of the great disaster, we expect to have aluminum shingles, and the glass industry has already developed a lifetime glass shingle.

★

Radio waves are now being used to spread the layer of tin on tin cans and thinner than it was before the war.

★

The Diesel engine is close to its long-sought ideal of one pound per horse power. This may indicate that this thrifty engine, already scheduled to power our postwar trucks, may also be suitable for our pleasure cars.

★

Little by little new ideas combine to make flying more practical for tomorrow's civilians. One of these is a simple device for night landing which uses two lamps aimed toward the ground. The beams of these lamps are focused so that they come together to form a single spot of light on the ground when the plane is at exactly the right height for "setting down."

★

A new fuse for artillery shells is said to be so sensitive that it will explode the shell on hitting a raindrop.

★

The use of aluminum can reduce the weight of a freight car from forty-five thousand to fifteen thousand pounds with a corresponding increase in capacity.

★

Factories have been built with heating pipes permanently laid in the solid concrete floor. The method seems to be practical, economical and suitable for the heating of our homes.

★

In spite of the war, the Dutch have been able to produce a new hybrid plant, a cross between the carrot and the beet called the "wobbie".

To supply a Pacific coast shipyard with 152' one-piece keels for Navy minesweepers, giant trailers are being used that haul 60 tons of Douglas fir logs of this length.

★

Experiments are being made with artificial teeth held in place by magnets.

★

It is expected that vast amounts of magnesium will be used after the war, and it is encouraging to know that our supply is large and beyond the reach of the enemy. Although there is only fourteen one-hundredths of one percent of magnesium in sea water, there are four and one-half million tons in a cubic mile.

★

Fifty thousand patents, formerly the legal property of our enemies, are now available to American industry.

★

The electron microscope will now measure particles as small as one-millionth of an inch.

★

The Civil Aeronautics Administration expects us to have half a million private and commercial airplanes by 1950.

★

A new synthetic textile filament, the finest yet produced by man or nature, is so small that it takes twenty thousand miles of it to weigh a pound.

Automobile tires are now being checked for invisible flaws by passing high-frequency sound waves through them.

★

Plastic bearings for machinery will require no lubricants for moderate speeds and loads, and in many cases water has been found to give sufficient lubrication for even high speeds and heavy loads.

★

"Facsimile", a method of printing a miniature newspaper by radio in individual homes, was tried experimentally before the war began. By this method the printing is done during the night and a newspaper, complete with illustrations and advertising, is ready at breakfast time.

★

There is a very good chance that we may have television in full color and three dimensions. It may also be possible to store up television broadcasts to be re-run later.

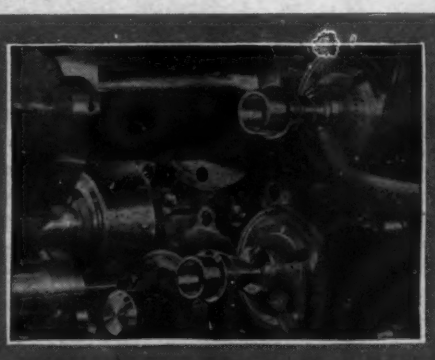
★

A micro-hardness tester is now made that can test a single microscopic grain of metal.

★

Shipwrecked sailors will soon have the benefit of a tiny searchlight no bigger than a walnut that is visible for 60 to 70 miles and good for 100 hours of use.

★



This big 8 spindle Conomatic completes seventeen operations required in the machining of an artillery shell fuse body *in 18 seconds.*

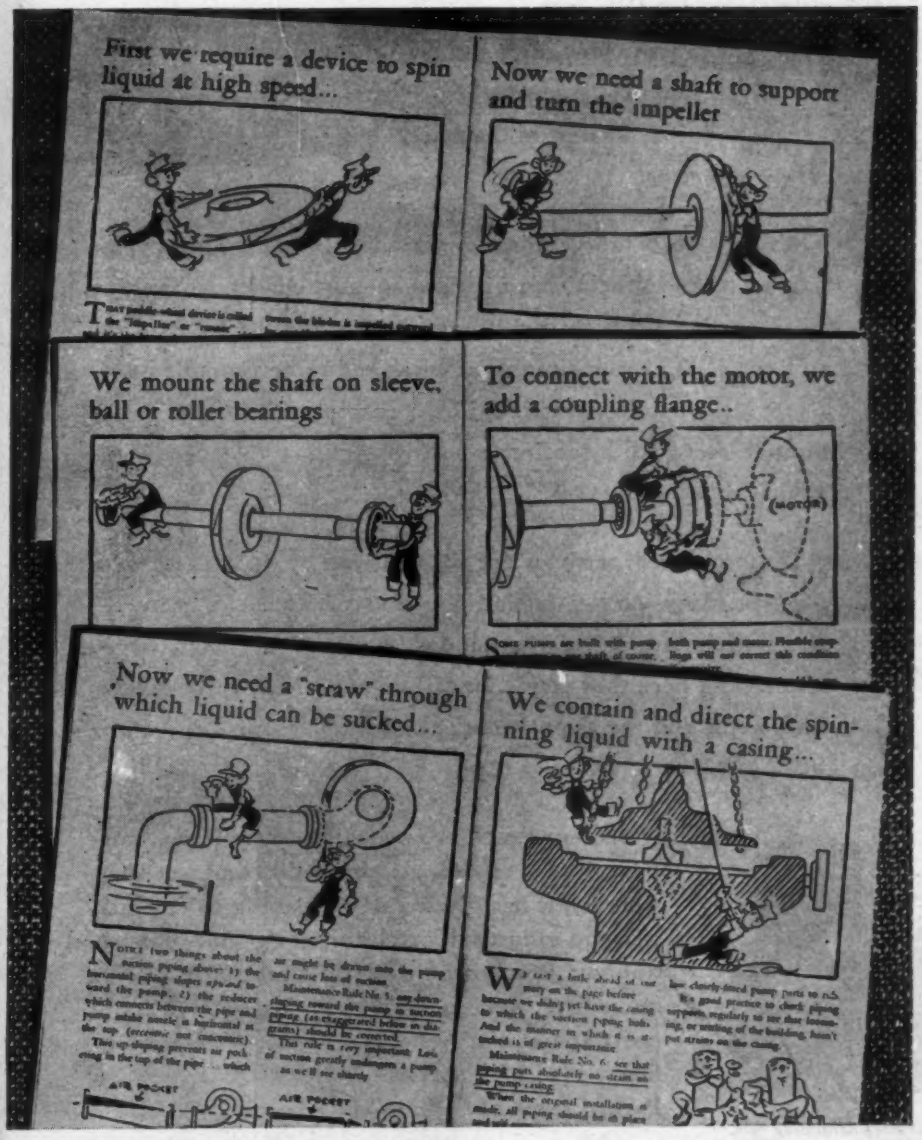
This is real production—the sort of production needed to win the war. Manufacturers will need this sort of production *after the war* if they are to meet competition, particularly if new ideas and better merchandise are to be put in the hands of all our people.

CONE

AUTOMATIC MACHINE CO., INC.

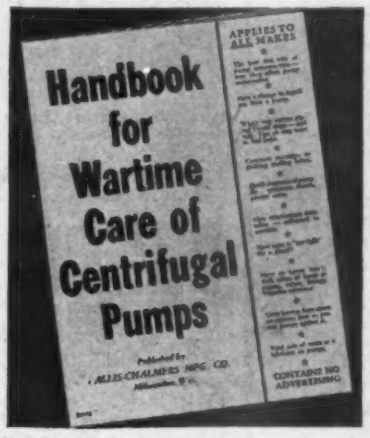
WINDSOR, VERMONT, U. S. A.

Let's Build a Pump!


First we require a device to spin liquid at high speed...
Now we need a shaft to support and turn the impeller
We mount the shaft on sleeve, ball or roller bearings
To connect with the motor, we add a coupling flange..
Now we need a "straw" through which liquid can be sucked...
We contain and direct the spinning liquid with a casing...

A PUMP IS BUILT— STEP BY STEP— IN A-C'S NEW PUMP MAINTENANCE GUIDE. AS EACH NEW PART IS ADDED, WE SEE WHAT IT DOES, HOW IT DOES IT, HOW IT MUST BE CARED FOR.

WITH MOST PUMPS today doing *3 and 4 times* their normal work, they need the finer kind of care set forth in Allis-Chalmers' new "Handbook for Wartime Care of Centrifugal Pumps". Every executive, engineer and maintenance man should have a copy of this informative book in his technical library!



This book applies to *all* makes of pumps — contains no advertising! Contents include: new preventive maintenance tips; *war* timetable for pump care; valuable tables, etc. Tear out coupon and send in now for your *free* copy!

ALLIS-CHALMERS MFG. CO.
Milwaukee 1, Wisconsin

Gentlemen:

Yes, I would like to receive, *free of charge*, a copy of your "Handbook for Wartime Care of Centrifugal Pumps".

(Name)

(Title)

(Company)

(Street Address)

(City and State)

A 1653-7

When you do need new pumps — look into the extra efficiency, ruggedness and long life of Allis-Chalmers centrifugal pumps... the famous "Electrifugal"... and all types for every purpose.

ALLIS-CHALMERS MILWAUKEE

WE WORK FOR VICTORY · WE PLAN FOR PEACE

HOW *PRECIPITRON** WORKS

You get 90% CLEANER Air with ELECTRIC Air Cleaning

Uncleaned air contains dirt particles of various sizes.

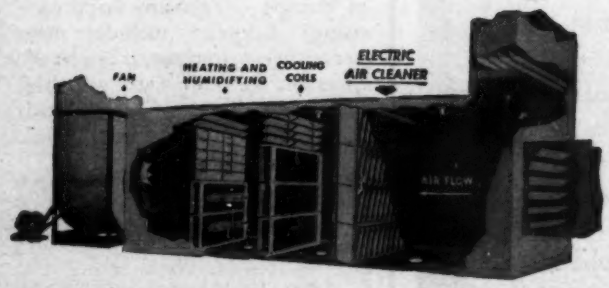
Mechanical cleaners permit small particles, or about 10% of the dirt, to "escape."

Precipitron removes the *small* particles, too; is 99½% efficient (based on weight tests).

Yes . . . 90% *cleaner* air than is provided by conventional air cleaners. For each ounce of dirt that "escapes" in a mechanical air cleaner, *less than 1/10 of an ounce* gets through the Precipitron. The reason for this is that the Precipitron, operating electrostatically, removes air-borne particles as small as 1/250,000ths of an inch in diameter.

Sealed within the ventilating duct so that all air must pass through it, the Precipitron operates silently, efficiently, with no more moving parts than a storage battery. At the front of the unit (or cell), two fine tungsten wires and three grounded rods create a strong electrostatic field. As each particle of dirt passes through this field, it receives a positive charge of electricity.

These charged particles are then carried by the air stream to *collector plates* located behind the electrostatic field. Here the dirt particles are quickly "grounded" on the oppositely charged plates. And here they stay . . . until the plates are washed down with water and the deposit flushed harmlessly down the drain.



Cross section of Precipitron installation in typical air conditioning duct.

Because Precipitron consistently removes more than 99½% of ALL air-borne dirt (measured by weight), it has given a new meaning to commercial and industrial air cleaning. For full information on Precipitron and its applications . . . for immediate use in vital war production . . . or postwar use in other fields . . . write Westinghouse Electric & Manufacturing Company, Edgewater Park, Cleveland, Ohio.

*Trade-mark registered in U. S. A.

Westinghouse Precipitron

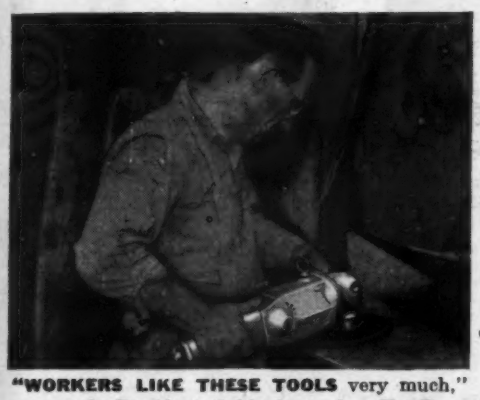
PLANTS IN 25 CITIES ○ OFFICES EVERYWHERE

Tune in on John Charles Thomas, NBC, Sundays, 2:30 p.m., E.W.T.

Electronics at Work

Top Executives Report Top Speed Production

. . . thanks to Van Dorn Power



"WORKERS LIKE THESE TOOLS very much," reports the President of this plant, where Van Dorn Portable Electric Sanders are used to finish aircraft propellers at war emergency speed.

"CHIP CASTINGS IN ¼ THE TIME," reports the Treasurer of this foundry where Van Dorn Portable Electric Hammers save man-hours in cleaning up castings for the Army and Navy.

"VAN DORN MAKES THE BEST TOOLS for our business," reports the General Manager of this organization, in which Van Dorn Electric Saws make quick work of countless sawing operations.

"SOLD ON VAN DORN AS THE BEST in their line," reports the President of the company in whose plant a battery of Van Dorn Electric Screwdrivers speeds assembly of distributor heads.

Read the comments from industrial executives which accompany the photographs on this page. They show just a few of the reasons why Van Dorn Portable Electric Tools are so widely used throughout war industry. Another reason for these outstanding performance records is: *Van Dorn Tools get their famous Power from motors which are Van Dorn built—each engineered for its specific job.*

And remember: With Van Dorn Tools, parts are readily interchangeable. Fast, expert service on repairs and parts is never more than 24 hours away, through one of 26 Factory Service Branches from coast-to-coast. There are Van Dorn Jobbers 'most everywhere, as ready sources of tool information and supply. For power-full electric tools—for help on any tooling problem—see your Van Dorn Jobber. The Van Dorn Electric Tool Co., 719 Joppa Road, Towson-4, Maryland.

"Van Dorn"

(DIV. OF BLACK & DECKER MFG. CO.)

PORTABLE ELECTRIC TOOLS

To You

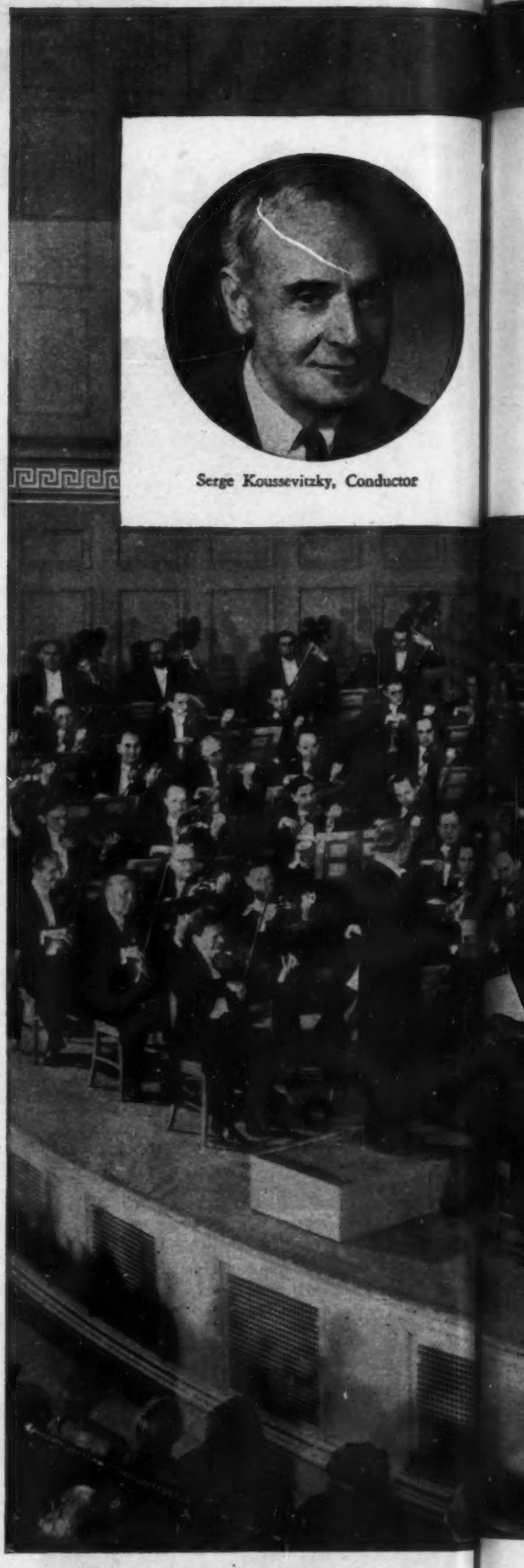
the men of American Science
and Industry working to
further American Good Living—

WE DEDICATE

our Radio Sponsorship of the
World's Finest Music by the
World's Finest Concert Orchestra...

THE BOSTON SYMPHONY

Every Saturday, at 8:30 p m (E.W.T.)
over 170 Stations of the Blue Network,
from New England to California.



Serge Koussevitzky, Conductor

ENGINEERING THAT AIDS ALL INDUSTRY
HELPS FURTHER AMERICAN GOOD LIVING

Allis-Chalmers invites Every Reader of this Magazine to tune in next Saturday and every Saturday thereafter

MUSIC — sister to every science and industry furthering Good Living — is Allis-Chalmers' choice of radio entertainment for America.

In the words of Serge Koussevitzky, world-famous conductor of the Boston Symphony itself: "Today American audiences show not only their love and admiration of music, but also a deep understanding of the necessity and importance of musical art in the progress of humanity."

Americans also enjoy the highest standard of living of any people on earth — because they are the mightiest industrial nation on earth.

That is why we respectfully dedicate to *you*, the Men of American Industry, our radio sponsorship of the Boston Symphony.

Today over 1600 Allis-Chalmers products are helping America to the earliest possible Victory — *after the war*, the same engineering will mean Good Living, the American Way. ALLIS-CHALMERS, MILWAUKEE, WIS.

A 1686

ALLIS-CHALMERS

—then he said to himself

"The LIE is my political weapon"

At the start of his activity, Adolph Hitler proclaimed to the world that his weapon was the LIE

—the all-out undiluted LIE

—and now see what happens to a structure founded on bosh:

(a) the theory of the blitz *blasted*

(b) the legend of invincibility *exploded*

(c) the infallibility of his "intuitions" *fizzled*

He could have fooled a lot more people for a lot longer time, if he had only tried the trick of nursing along old truths—now turned into fallacies—but still adhered to by the unthinking majority.

For *Progress* has a way of flipping the FACTS of yesteryear into FLOPS almost overnight. The follower of an OUTDATED fact may easily find himself nursing a progress-blocking FLOP.

Here, Adolph, are samples of yesteryear FACTS now turned FLOPS

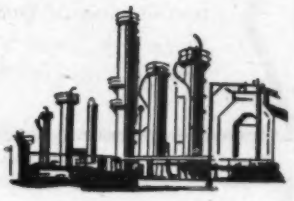
FLOPPED FACT 1: "You can't produce all-welded ships" . . . . . .

. . . . Recourse to arc welding has filled the seven seas with them.

FLOPPED FACT 2: "You can't arc weld high-temperature, high-pressure piping" . . . . . .

. . . . The one safe way is through recourse to arc welding.

FLOPPED FACT 3: "You can't weld cracking stills" . . . . . .



. . . . Without recourse to arc welding—our armed forces would be without high octane gas.

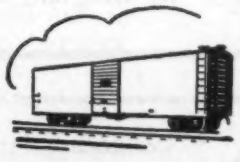
FLOPPED FACT 4: "You can't produce army tanks with arc welding" . . . . . .

. . . . Through recourse to arc welding—it's the only kind they're producing today.

FLOPPED FACT 5: "You can't erect buildings by arc welding" . . . . . .

. . . . Savings in steel and money are represented in thousands of structures of every type—through recourse to arc welding.

FLOPPED FACT 6: "Railroad cars are taboo for arc welding" . . . . . .



. . . . Watch them rolling the rails in every state—through recourse to arc welding.

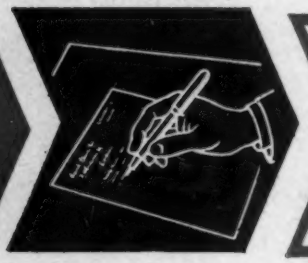
THE LINCOLN ELECTRIC COMPANY • CLEVELAND 1, OHIO

America's greatest natural **recourse**

ARC WELDING

You Save[1] and Save[2] and Save[3]

1 SAVE ORDERING TIME



Instead of buying two separately mounted devices—a motor-circuit switch and a magnetic starter—you buy one factory-co-ordinated unit that controls and protects your motor. Simply specify the motor rating and indicate the type of motor-circuit switch you want—and we'll send you the control you need.

2 SAVE INSTALLATION TIME

Users report a 50 per-cent reduction in mounting time, 40 per-cent reduction in wiring time, as compared with the installation of two separate devices. You mount one device—not two. You connect only nine terminals—not fifteen. You get your motors into operation quicker.

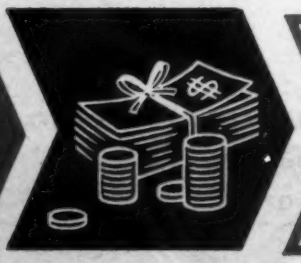
3 SAVE MAN POWER

By eliminating one complete mounting job on every installation, you save valuable man power. And because the cover cannot be opened while there is power on the starter, your men have more protection against accidental injury.

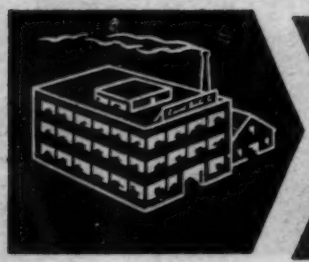
4 SAVE CRITICAL MATERIALS

By buying both the motor-circuit switch and the magnetic starter as one compact unit, you save copper wire, steel conduit, and fittings that are necessary for installing two separately mounted devices—plus the saving gained by using only one steel enclosure instead of two.

5 SAVE MONEY



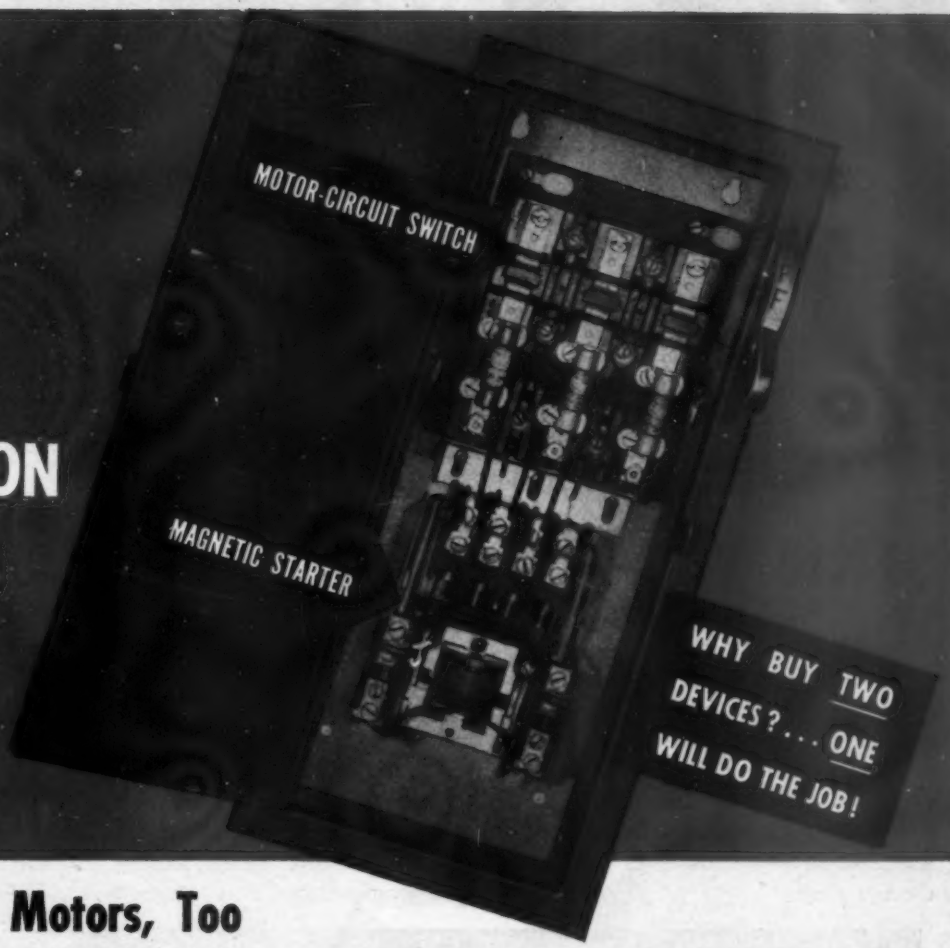
Combination starters cost slightly more than two separately mounted devices, but this difference is more than made up by the savings in wire, conduit, fittings, and installation-labor costs. This statement is based on the actual experience of users.



6 SAVE PLANT SPACE

Combination starters take up less mounting space than separately mounted safety switches and starters. Because of this you can mount them in small, unused places near the operators.

and Save[4] and Save[5] and Save[6]...



COMBINATION STARTERS

- - - and Save Your Motors, Too

With G-E combination starters, you're sure that the motor-circuit switch or breaker has the proper rating and interrupting capacity for the magnetic starter with which it is used. The fuses or breaker are coordinated with the thermal overload relays to give complete motor protection under short-circuit or overload conditions.

It's the simple, logical way to get control and protection for your motors—in one compact, easy-to-install unit. Why buy two devices, when this one will do the job?

NAME YOUR HAZARD

G-E combinations come in enclosures to meet any operating condition: dust-tight, watertight, oil-immersed, general-purpose, or for hazardous locations. Available for motors from 1 to 1000 horsepower.

GENERAL ELECTRIC

Next time you order motor control, save seven ways by specifying General Electric combination starters.
General Electric Company, Schenectady, N. Y.

Every week 192,000 G-E employees purchase more than a million dollars' worth of War Bonds.

General Electric Company, Section A676–129
Schenectady, N. Y.

Please send me the bulletins checked below:

- GEA-3715—Combination starters: general-purpose, watertight, and dust-tight
- GEA-3660–2300-volt combination starters
- GEA-3804—Combination starters for hazardous locations
- GEA-3541—Oil-immersed starters

Name.....

Company.....

Address.....

City..... State.....

Supervisor in a Sharp & Dohme plant tells an assistant that watching the resistance of distilled water, on the Micromax Recorder, is a necessary first step in preparing "pyrogen-free" water for bottling.

Preparing an injection of blood plasma; 250 cc of double-distilled "pyrogen-free," sterilized water from a sealed bottle is added to an equal amount of "Lyovac" (dried) normal human plasma. The result is the marvelously effective life-saving fluid, initiated by you who give your blood to the Red Cross.

STILLS PRODUCE PURER WATER With Help of MICROMAX Recorder

In the daily distilling of thousands of gallons of water for blood-plasma and other pharmaceutical use, technicians in the big Philadelphia plant of Sharp & Dohme Inc. of course check the water's purity in various ways which most businesses neither use nor need.

But S&D make at least one check which is useful wherever an automatic still is running—they measure and record the water's electrolytic resistance, as a guide to the proper operation of the still.

High resistance means purity; if the resistance drops, it is because impurity is appearing. Impurity may be due to running the still too hard, or to neglect in cleaning out its accumulated solids; or to any other condition which unbalances the still's operation. But, regardless of the cause, the result is impure water which may contaminate the larger supply and cause the rejection of the whole.

And so Sharp & Dohme guard against this by using sensitive, accurate Micromax Recorders which automatically and continuously show the resistance at all times, and draw a record for use in case questions arise.

In this particular plant, the still attendants watch the recorders as a part of their routine, but other users of the same Micromax instruments equip them to open a valve and automatically divert any impure distillate. The general practice is to use just one multiple-point Micromax for an entire battery of stills.

This Micromax Recorder is a rugged, highly dependable instrument. If you need one, an L&N engineer will gladly help in its selection; or if you want a publication, ask for Catalog EN-95, free on request.

Jrl Ad N-95-702(lb)

Technicians at a battery of automatic stills in the Philadelphia plant of Sharp & Dohme, Inc. The Micromax Recorder, above, continuously records electrolytic resistance of water en route to bottles, and warns if impurity appears.

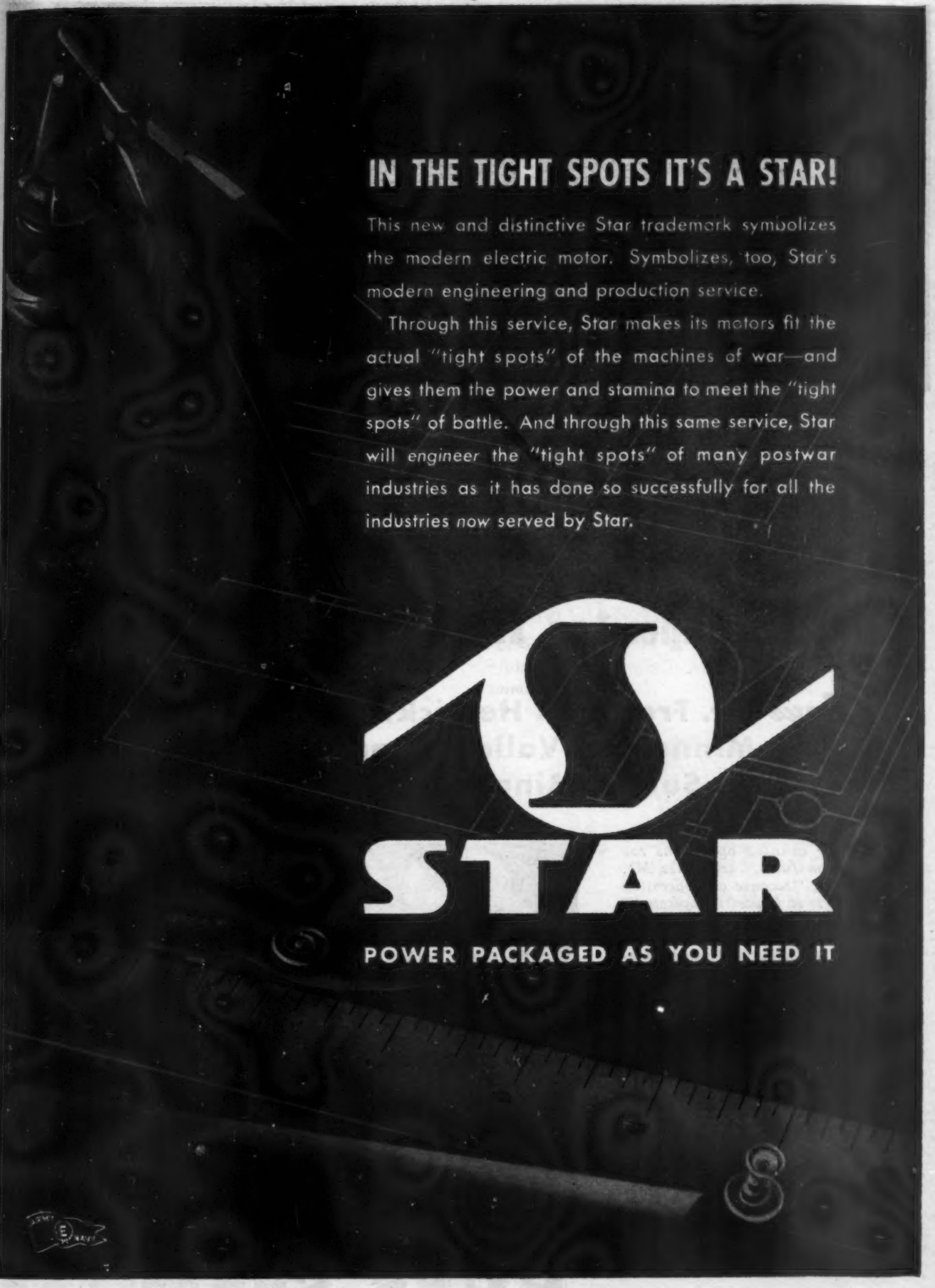
depends on me!

A Slogan For Every American

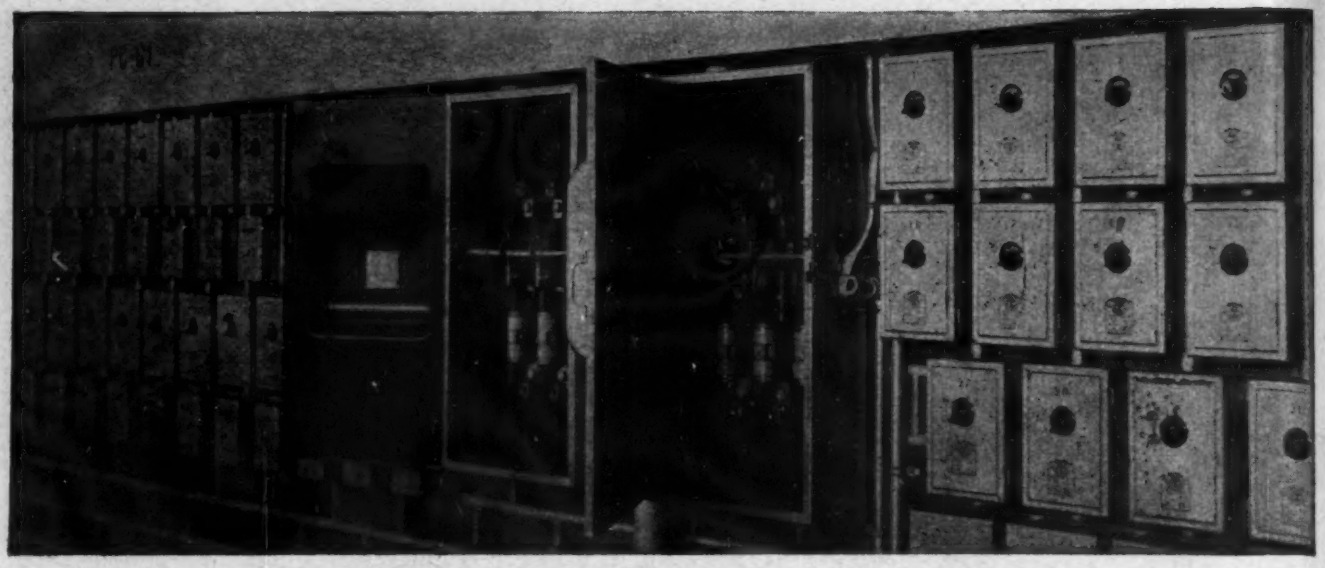
LEEDS & NORTHRUP COMPANY, 4909 STENTON AVE., PHILA., PA.

LEEDS & NORTHRUP

MEASURING INSTRUMENTS · TELEMETERS · AUTOMATIC CONTROLS · HEAT-TREATING FURNACES


IN THE TIGHT SPOTS IT'S A STAR!
This new and distinctive Star trademark symbolizes the modern electric motor. Symbolizes, too, Star's modern engineering and production service.
Through this service, Star makes its motors fit the actual "tight spots" of the machines of war—and gives them the power and stamina to meet the "tight spots" of battle. And through this same service, Star will engineer the "tight spots" of many postwar industries as it has done so successfully for all the industries now served by Star.
STAR
POWER PACKAGED AS YOU NEED IT

STAR ELECTRIC MOTOR COMPANY, BLOOMFIELD, N. J.



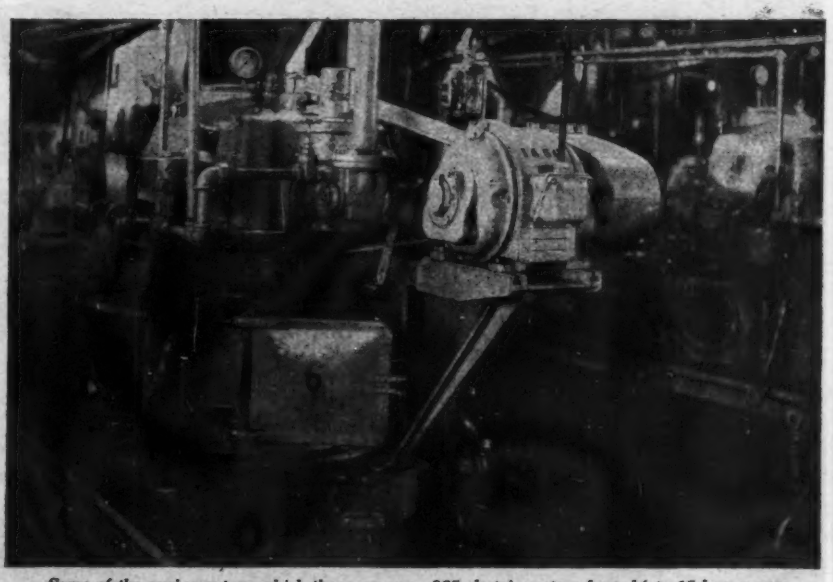
BUSS Super-Lag fuses are used in feeder and branch circuit switches.

"Needless Motor Shutdowns Decreased Where We Installed BUSS Super-Lag Renewable Fuses"

Says Mr. Frank M. Herrick, Chief Engineer, Minnesota Valley Canning Company, Le Sueur, Minnesota

"Our canning operations are tough on fuses," continues Mr. Herrick, "because our operating season is so limited we operate 22 hours a day—and use the other two hours to clean up the machines. The plants are thoroughly washed, consequently, the steam and moisture tightens motor belt drives. Condensation and moisture in the motors, plus tightened belts, make motor starting conditions a heavy burden on fuses. BUSS Super-Lag fuses have definitely minimized this problem because of the long time-lag and positive contacts of the fuses.

"Where we have installed BUSS Super-Lag Fuses we have noticed an appreciable decrease in needless shutdowns, which we credit to the time-lag of BUSS Fuses as well as to their simple design."



Some of the equipment on which there are some 365 electric motors from ¼ to 15 horsepower.

BUSS Super-Lag

Do you have a tough fuse problem—like the one at Minnesota Valley Canning Company? You can probably solve it as easily as Mr. Herrick did—by using all BUSS Super-Lag fuses.

Buss fuses require no maintenance or periodic inspection. They don't open needlessly. If one opens, you can be sure some condition needs correction. When one opens, it requires less than 45 seconds to renew with an inexpensive link.

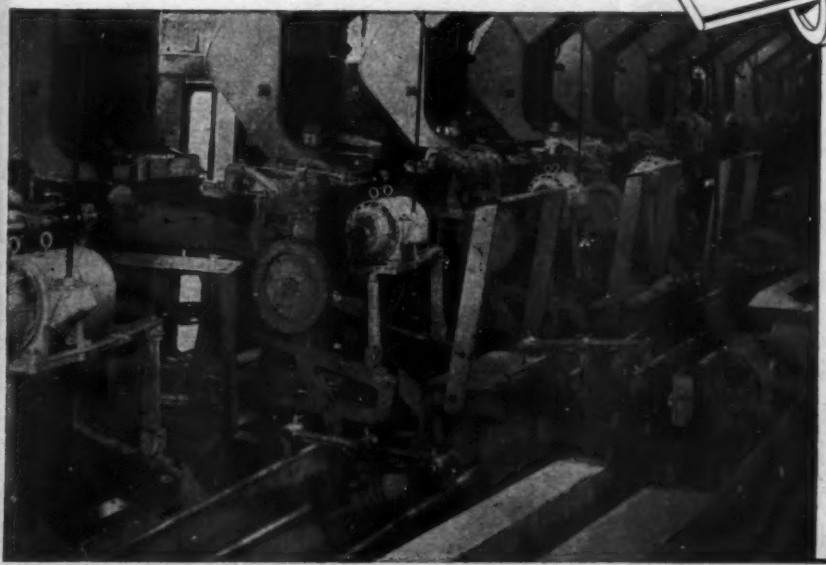
Here is why BUSS fuses greatly reduce or entirely prevent needless blows

The fuse case is designed to insure good contact on the link, even when the fuse is renewed by an inexperienced person—and it is so designed that vibration or heavy overloads or the constant heating and cooling of the fuse will not permit poor contact to develop. Thus, excessive heating which causes fuses to blow needlessly is prevented.

The fuse link used is the famous "BUSS Super-Lag." It has lag-plates attached to it. These give it a long time-lag so that unusually heavy starting current or other harmless overloads will not cause the fuse to blow.

How to solve the "shutdown problem"

Pass the word along that all purchase records dealing with circuit protective devices should be immediately changed to call for BUSS Super-Lag Renewable fuses. Then, as fuses are replaced or new installations made, your plant will automatically get the benefit of the carefree, trouble-proof protection that BUSS Super-Lag fuses afford. BUSSMANN MFG. CO., University at Jefferson, St. Louis 7, Mo., *Division McGraw Electric Company.*



WHY BUSS FUSES DON'T BLOW NEEDLESSLY

TEN FEATURES

in the design of the FUSE-CASE help make it possible.

***and* THE SUPER-LAG**

development in the FUSE-LINK completes the job.

The Minnesota Valley Canning Co. plants turned out nearly a million cases of these fine products in 1943.

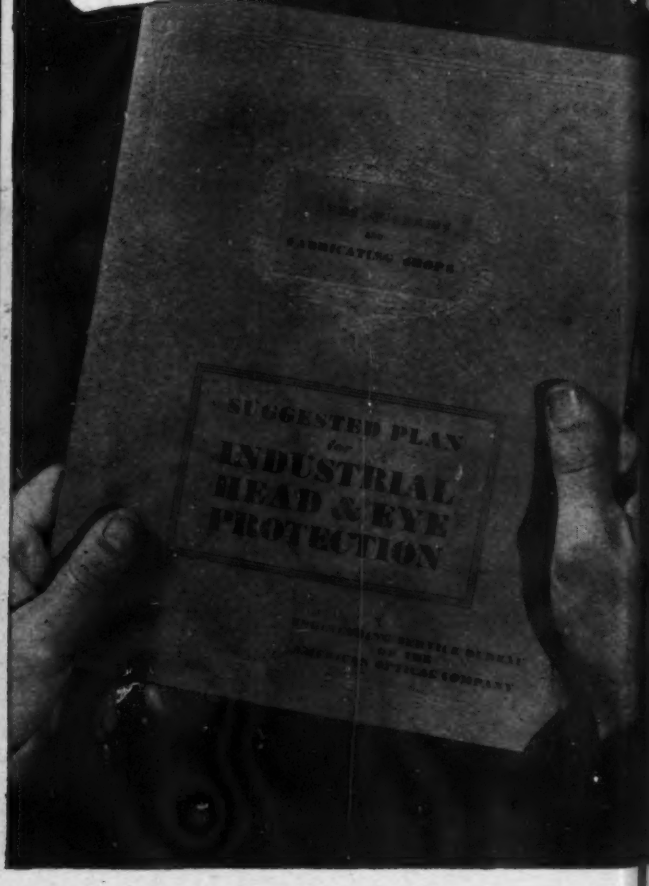
FUSES SOLD THROUGH WHOLESALERS

AO AMMUNITION

that will help Win the War against EYE ACCIDENTS in Your Plant ★ ★ ★ ★ ★ ★ ★ ★

SAFETY GOGGLES . . . each especially designed for comfort and protection against specific eye hazards. AO also offers helmets, hoods, respirators, welding glass, and safety clothing for men and women.

SAFETY PROGRAM . . . without charge, a trained AO Safety Representative will make a careful analysis of eye hazards in your plant, and recommend an effective eye protection program.



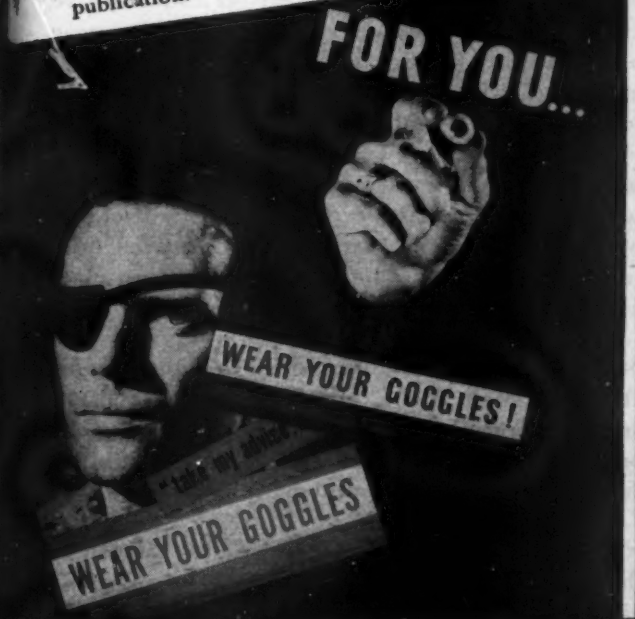
To help you intensify your offensive against eye accidents, American Optical Company offers a complete line of head and eye protection equipment. Every product in the line has been scientifically designed to render utmost protection, fit comfortably, and withstand severe use and abuse.

Then too, AO provides valuable assistance in putting these safety products into effective, popular use: analyses of plant eye hazards, posters, charts, guides, informative literature, a goggle adjustment training film and booklet, and the helpful cooperation of our trained Safety Representatives.

Behind every AO product and service stands the experimental and development departments of the world's largest supplier to the ophthalmic professions. You receive the benefit of a wealth of pioneering experience, optical research, and practical planning that no other organization in the eye protection field can offer you.

Take full advantage of AO facilities. Call the AO Branch Office near you. Have an AO Safety Representative call to demonstrate the service he can render you.

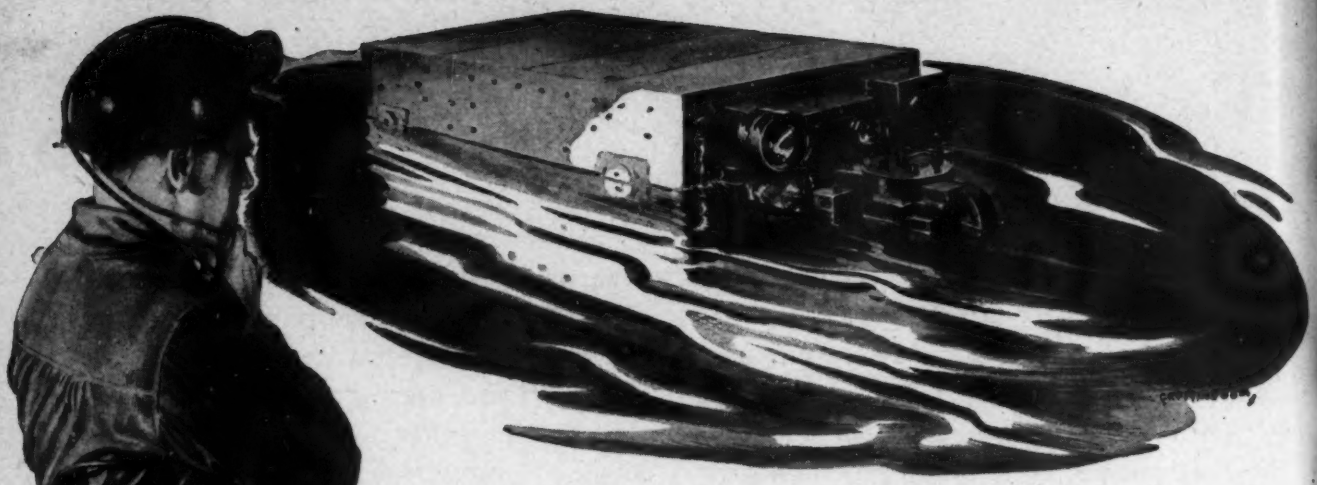
SAFETY PROMOTION MATERIALS . . . without charge, AO provides safety posters, charts, guides, and leaflets, and also "The SAFETY CLIPPER" containing material on eye safety which can be reproduced in your employee publication.



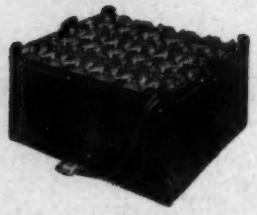
TRAINING FILM . . . without charge, AO will loan you a 16 mm. sound movie which demonstrates the simplest, quickest methods of fitting non-prescription safety goggles.

American Optical
COMPANY
SOUTHBRIDGE, MASSACHUSETTS

MANUFACTURERS FOR 110 YEARS OF PRODUCTS TO AID AND PROTECT VISION. BRANCHES IN ALL PRINCIPAL INDUSTRIAL CENTERS



EDISON ALKALINE BATTERY *SURVIVES* FIRE & FLOOD



News from the Far North for Users of Industrial Trucks...

ADVANTAGES OF THE EDISON ALKALINE BATTERY IN INDUSTRIAL TRUCKS AND TRACTORS

★ It is durable mechanically. High strength steel construction is used in the containers, grids, pole pieces, etc. The electrolyte is a preservative of steel.

★ It is foolproof electrically. It may be accidentally short-circuited, over-charged, over-discharged, or even charged in the reverse direction without injury.

★ It can be charged rapidly. It is not subject to finish-rate limitations. It requires no equalizing.

★ It withstands temperature extremes. It is not damaged by freezing. Free air spaces on all sides of all cells provide ventilation for rapid cooling under high temperature conditions.

★ It is simple to maintain. Merely charge adequately, add pure water, keep clean and dry.

★ Its tray assembly and cell connections are extremely simple.

★ Its life is so long that its annual depreciation cost is lower than that of any other type of storage battery.

When a coal mine in Alaska caught fire recently, a 10-year-old Edison Alkaline Battery on a locomotive was trapped in the fire area. After the mine was flooded to put out the fire, the locomotive remained under water for nearly two months before it could be recovered.

When the battery was inspected, the tops of several cells were found to have been damaged by fire, but this was the only visible injury and required only minor repairs. Then the battery was given an electrical test. It delivered full rated capacity.

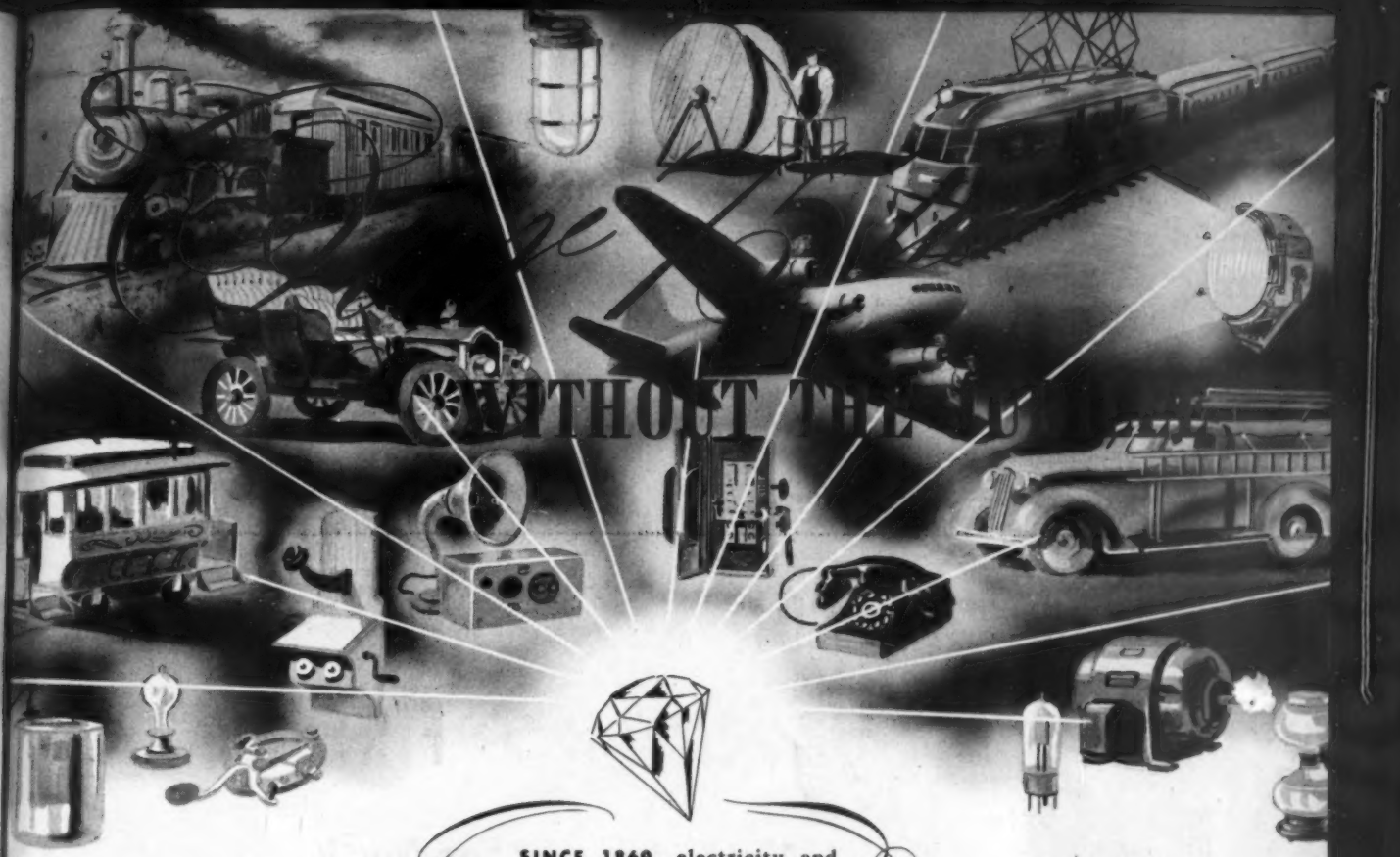
Although Edison Alkaline Batteries are not bought to withstand such abuse, the fact that they often do, in mines, railroads and industry, serves to demonstrate the great reserve of dependability which they have available under all conditions.

Some of the unique characteristics which account for the long life and dependability of the Edison Alkaline Battery are cited in the column at the left.

EDISON STORAGE BATTERY DIVISION, THOMAS A. EDISON, INCORPORATED, WEST ORANGE, NEW JERSEY

Edison

ALKALINE BATTERIES



SINCE 1869, electricity and GRAYBAR have grown up together. Through peace and war, with every electrical advance, GRAYBAR has extended its distribution services in step with the needs of the day . . . and of the Nation.

Sure, it's something for GRAYBAR to be 75 — but all the busy years behind us mean nothing to you, or to America, except as they have improved our perspective for today's first job.

In a modern war, every industrial method or technique is a weapon matched against the production forces of the enemy. In your job, you have to help outclass some of Hitler's crowd this very morning. So have we at GRAYBAR, and we can't do it with our heads turned toward the past.

Thus, we're chiefly glad to be 75 because the amassed experience of those years — the long slow process of "learning the ropes" — is helping us meet each new and critical problem of electrical supply and distribution better than we could hope to do as a youngster at the game. And we can't imagine a better use to make of it.

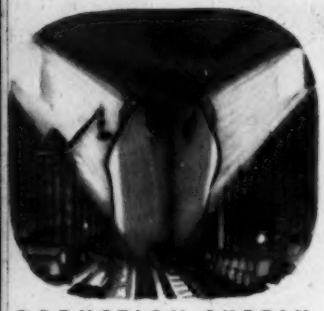
Beyond that, we think the perspective of many years of peace-time electrical progress — antedating even lamps and motors — will help us to serve you better in the "conversion" and post-war years. (As for the jubilation, we'll save that to add to yours on V-day!)

GraybaR

IN OVER 80 PRINCIPAL CITIES

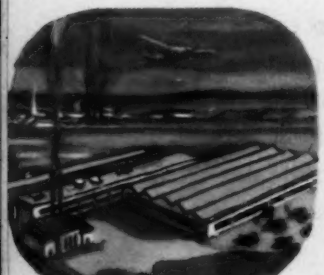
First Service of Supply

GRAYBAR *in War*



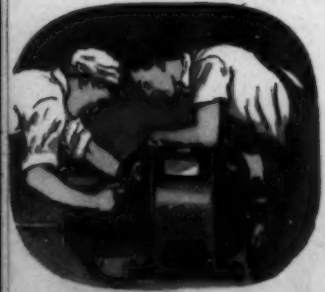
'RODUCTION SUPPLY

lectrical parts and materials to be stalled in ships, planes, communica- ons units and other "fighting front" quipment are GRAYBAR'S No. 1 re- ponsibility today. With them goes pecialized service to aircraft plants, hipyards and all other key war plants; n selection, application procurement nd scheduled delivery.



ONSTRUCTION SUPPLY

ack of America's mighty war plant— ilitary and industrial—is a phenom- al construction job. Electrical con- actors, engineering firms and the ilitary services engaged in the work pended upon GRAYBAR as a time- ving connecting link with the mak- s of thousands of different electrical nstruction items.



MAINTENANCE SUPPLY

To keep our productive machine running full-tilt, to distribute power, to light the work, and maintain communication lines, GRAYBAR speeds electrical replacement parts to points of greatest need. Emergency procurement "via GRAYBAR" has saved millions of productive man-hours.

Grayba

MOBILIZATION POINTS IN OVER 80

Executive Offices: GRAYBAR BLDG., NEW YOR

...ly for an Electrical Nation

GRAYBA...
in Peace

CONTRACTOR'S SUPP...

The peacetime job of reequipp... America electrically will get its st... with electrical contractors: Pla... homes, offices, institutions, stores ... buildings of every type will be ... manding conversion and betterme... To contractors, GRAYBAR will o... more bring the newest and best ... wiring materials, lighting units, ... naling equipment.

APPLIANCE DEALER SUPP...

To dealers handling electrical ap... ances, GRAYBAR will again be b... with the fast-moving popular ite... that help build a sound and solv... business. With so much new and ... tried merchandise coming to mar... you'll appreciate GRAYBAR's help ... selecting the better lines.

REHABILITATION SUPPLY

Distribution services, tailored to the the electrical reconversion needs of industrial plants, public utilities, municipalities, railroads, telephone companies, etc., will be more essential than ever. Experienced GRAYBAR specialists will again be devoting themselves to the special electrical needs of each such group.

Teamwork...DOWN THE YEARS

On its 75th Anniversary, GRAYBAR is proud of its long-lasting relationships with leading suppliers. This intimate contact assures you of more complete product information, greater support in expediting emergency orders, and twofold co-operation in assuring a satisfactory purchase.

BEFORE 1900

Babax Division of Pass & Seymour, Inc.
American Crossarm and Conduit Company
American Electrical Heater Co.
American Steel & Wire Company
The Ansonia Electrical Company
The Arrow-Hart & Hegeman Electric Co.
Easton & Lockport Block Co.
The Bryant Electric Company
Calculograph Company
Crouse-Hinds Company
Diamond Expansion Bolt Company, Inc.
Edwards and Company
The Electric Storage Battery Co
General Cable Corporation
General Electric Company
Habirshaw Cable and Wire Div.
Phelps Dodge Copper Products Corporation
Harvey Hubbell, Inc.
Herson Electric Company
Hoech Company
Ilsthias Klein & Sons
National Carbon Company, Inc
National Pole & Treating Co
The Okonite Company
Owens-Illinois Glass Company
Hemingray Division
Self-Winding Clock Co., Inc.
Stanley & Patterson Division
The Schwarze Electric Company
The Thomas & Betts Co.
Western Electric Company
Weston Electrical Instrument Corporation
The Whitney Blake Company

BEFORE 1910

Frank Adam Electric Co.
Benjamin Electric Mfg. Company
Boston Wove Hose & Rubber Co.
Columbia Metal Box Co.
Hamilton Beach Company
Division of Scovill Manufacturing Company
The Holtzer-Cabot Electric Co.
Hubbard and Company
G Electric Ventilating Co.

To Bring Them Back More Quickly

To the 503 GRAYBAR employees now in service, the "home folks" in offices and warehouses have pledged unstinted support. If service in your behalf can help to end the war more quickly, your call will get "all-out" co-operation – day or night.

Indiana Steel & Wire Company
International Creosoting & Construction Co.
McGill Manufacturing Co., Inc
Electrical Division
National Electric Products Corp.
National Fireproofing Corp.
The National Telephone Supply Company
Simplex Wire & Cable Co.
Square D Company
Switch and Panel Division
Veeder-Root, Inc.
The Wiremold Company

BEFORE 1920

BullDog Electric Products Co.
Bussmann Mfg. Co.
A. B. Chance Co.
Utilities Division
Churchill Cabinet Company
Curtis Lighting
Dossert & Co., Inc.
Economy Fuse & Manufacturing Company
Edison General Electric Appliance Company, Inc.
Thomas A. Edison, Inc.
Faries Manufacturing Company
The Fibre Conduit Comany
Fullman Manufacturing Co.
The Gray Manufacturing Co.
Kopp Glass, Inc.
Ward Leonard Electric Company
Manning, Bowman & Co.
Mitchell-Rand Insulation Co., Inc.
Frank W. Morse Co.
Mueller Electric Co.
National Lead Co.
National Sewing Machine Co.
Philadelphia Electrical & Manufacturing Co.
Russell & Stoll Co., Inc.
H. B. Sherman Manufacturing Co
Templeton, Kenly & Co.
The Trumbull Electric Mfg. Co
Union Insulating Co.
The F. W. Wakefield Brass Co.
The Youngstown Sheet and Tube Company

BEFORE 1930

The Adjustable Fixture Company
Appleton Electric Co.
Armstrong Cork Company, Inc.
Blaw-Knox Company
L. S. Brach Mfg. Corp.
J. H. Bunnell & Co., Inc.
Chase Brass & Copper Co., Inc.
Chicago Flexible Shaft Company
Clayton & Lambert Mfg. Co.
Coffing Hoist Company
Cook Electric Company
T. J. Cope, Inc.
Copperweld Steel Co.
Day-Brite Lighting, Inc.
Electrical Engineers Equipment Company
Elkhart Rubber Works
Ericson Mfg. Co.
The Everstick Anchor Co
Fahnestock Electric Co.
Federal Electric Company
The Four Wheel Drive Auto Co.
Eagle Division
Frankel Connector Co., Inc
General Radio Company
The A. C. Gilbert Company
Greenlee Tool Company
Hankscraft Company, Inc.
Hart Mfg. Co., Inc.
Hub Electric Corporation
Ideal Commutator Dresser Co.
Inland Glass Works
Division of Chamberlain, Inc.
Kester Solder Co.
The H. R. Kirkland Company
Kleigl Brothers
Leeds & Northrup Company
Leich Electric Co.
The Linen Thread Co., Inc.
Lufkin Rule Company
W. N. Matthews Corp.
McEvoy Cord & Cable Co., Inc.
McGraw Electric Company
Minnesota Mining & Mfg. Co.
Murlin Mfg. Co.
Northern Industrial Chemical Co.
H. K. Porter, Inc.
Radiotron Division
R.C.A. Mfg. Co.
Reliable Electric Company
Revere Clock Company
Revere Electric Mfg. Co.
Reynolds Electric Co.
W. H. Salisbury & Company
SherwinWilliams Co.
Steel City Electric Co.
Steel and Tubes Division
Republic Steel Corporation
Stromberg Carlson Company
Struthers Dunn, Inc.
The Swartbaugh Mfg. Co.
Telkor, Inc.
The Thompson Electric Co
The Union Metal Mfg. Co.
United Metal Box Co.
United Motors Service, Inc.
Warren Telechron Company
Weber Electric Company
Webster Electric Company
Wesix Electric Heater Co.
Wheeler Reflector Company
Edwin L. Wiegand Company
Daniel Woodhead Company

BEFORE 1940

L. B. Allen Co., Inc.
American Brake Shoe & Foundry Co.
American Manufacturing Company
The Art Metal Company
The Autocall Company
Burgess Battery Company
Century Lighting, Inc.
Colt's Patent Fire Arms Mfg. Co.
Cordley & Hayes
Corning Glass Works
Cory Glass Coffee Brewer Co.
Dazor Mfg. Co.
W. C. Dillon & Company, Inc.
The Duff-Norton Mfg. Co.
The Emerson Electric Mfg. Co.
G & W Electric Specialty Co.
The P. A. Geier Company
Gibson Electric Refrigerator Corp.
Gillinder Brothers, Inc.
Gleason-Tiebout Glass Co.
Greist Mfg. Co.
A. E. Halperin Co., Inc.
Hobart Mfg. Co.
Horni Signal Mfg. Corp.
Independent Pneumatic Tool Co.
Jensen Radio Mfg. Co.
Kelvinator
Div. of Nash-Kelvinator Corp.
Knox Porcelain Corp.
Landers, Frary & Clark
Lewis Sanitary Tool Co.
Lorain Products Corporation
Hugh Lyons and Company
McCabe-Powers Auto Body Co.
The Mercoid Corporation
Mica Insulator Company
Mineralac Electric Co.
Mitchell Manufacturing Co.
National Enameling & Stamping Company
Noblitt-Sparks Industries
Noma Electric Company
Ohio Brass Company
Owens-Corning Fiberglass Corp.
Par-Metal Products Corp.
Philco Corporation
Storage Battery Division
Pittsburgh Reflector Co.
Premax Products
Division of Chisholm Ryder Co., Inc.
Prime Mfg. Co.
Proctor Electric Company
Div. of Proctor & Schwartz, Inc.
Raytheon Manufacturing Co.
Electrical Equipment Division
Rival Mfg. Co.
St. Louis Cordage Mills
Sangamo Electric Company
Scanlon-Morris Co.
Seymour Smith & Son, Inc.
Silvray Lighting, Inc.
Sonora Radio & Television Corp.
Southern Asbestos Co.
Steam-O-Matic Corp.
Steber Manufacturing Co.
Stewart-Warner Corporation
Superior Neon Products Company
Teletype Corporation
Thermador Electrical Mfg. Co.
Triangle Conduit & Cable Co., Inc.
The Utica Drop Forge & Tool Co.
Vulcan Electric Co.
Waring Corporation
Western Block Co.

SINCE 1940

Andertube Manufacturing Co.
Betts & Betts Corp.
Detroit Macoid Corporation
The Dexter Company
R. W. Fieroh Company, Inc.
Peter Gray, Inc.
Heinze Electric Co.
Holophane Co., Inc.
International Derrick & Equipment
Division of International Stacey Corp.
Justrite Manufacturing Company
Killefer Manufacturing Corp.
Lister-Blackstone, Inc.
Donald P. Mossman, Inc.
Paragon Electric Co.
Perkins Marine Lamp and Hardware Corp.
Precision Castings Co.
Seamless Rubber Co.
F. A. Smith Mfg. Co., Inc.
Smoot-Holman
Surprenant Electrical Insulation Co.
The Tappan Stove Company
Viking Instrument Co.
E. R. Wagner Mfg. Company
Walker Electrical Company
Wilcox, Crittenden & Co.
Willard Storage Battery Co.
Wilson Welder and Metals Co., Inc.

★
503

GraybaR

IN OVER 80 PRINCIPAL CITIES

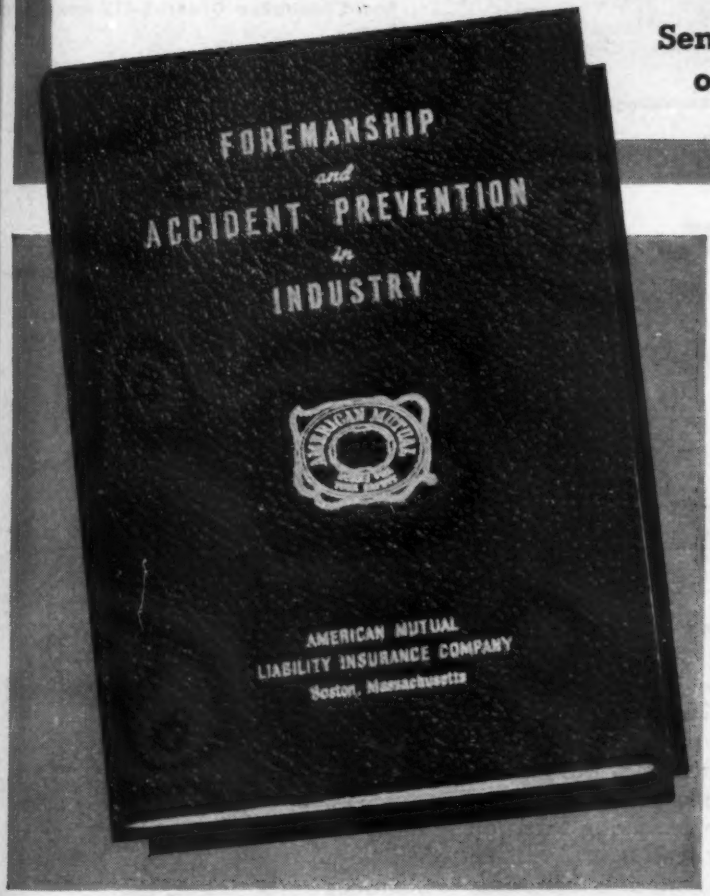
MAKE YOUR OWN SAFETY-MINDED FOREMEN

American Mutual's new FREE book

FOREMANSHIP AND ACCIDENT PREVENTION IN INDUSTRY

will help solve your supervisory problem of today

Send for your free copy now of this 94-page textbook



"Foremanship and Accident Prevention in Industry" is a new book of practical help—written by American Mutual Engineers out of their more than 50 years' experience in industrial protection. It's sound common-sense about:

- Preventing plant accidents
- Selecting and training foremen
- Choosing safe protective clothing
- Employing women in industry

Table of Contents of Foremanship and Accident Prevention in Industry

Chapter 1. The Foreman—his job, his qualifications.
Chapter 2. The causes of accidents.
Chapter 3. Controlling accident hazards in the plant.
Chapter 4. How proper maintenance prevents accidents.
Chapter 5. Housekeeping—Its relation to accident control.
Chapter 6. Selecting, training, and supervising people to increase production and prevent accidents.
Chapter 7. Accident prevention aids for the foreman.

Prepared by

AMERICAN MUTUAL

The first American liability insurance company.

A leader in Workmen's Compensation, Contractors', Public Liability, Fire, Automobile, Theft, Fidelity Bond, and other insurance for industry.

Pioneer in industrial accident prevention.

Officers in principal centers.

American Mutual has always saved policyholders 20% or more through dividends—paid off more than $220,000,000 in claims.

FREE SEND THIS COUPON TO AMERICAN MUTUAL NOW

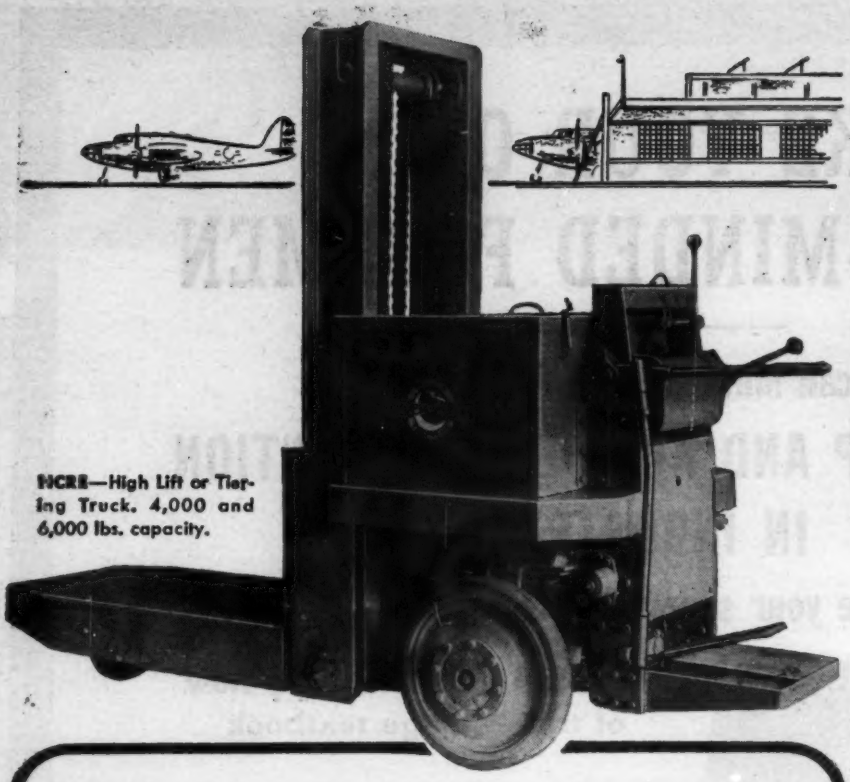
Department F5
American Mutual Liability Insurance Company
142 Berkeley Street, Boston 16, Massachusetts

Please send me FREE BOOK "Foremanship and Accident Prevention In Industry."

Name.....

Company.....

Address.....

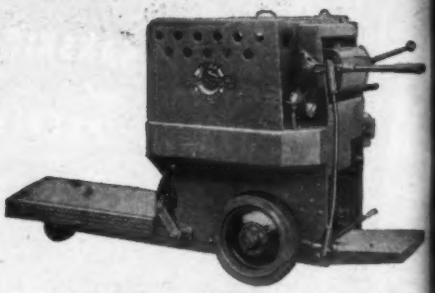


HCRE—High Lift or Tiering Truck. 4,000 and 6,000 lbs. capacity.

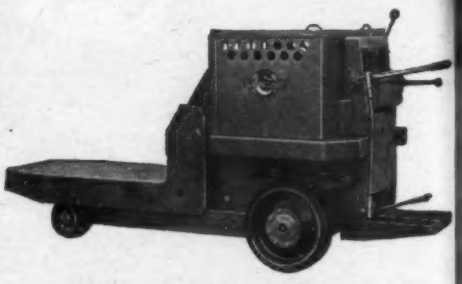
"Wings" for Materials Handling

Three of the Crescent Models approved under War Production Board Limitation Orders L-112 and L-112a.

HOW CRESCENT *Electrified* THE AVIATION INDUSTRY!



LO-LIF-TOER (LDLF)—Foot Lift Elevating Platform Truck. 3,000 lbs. capacity.



NDRE—Low Lift Elevating Truck. 4,000 and 6,000 lbs. capacity.

NTW—Twin Front Wheel Heavy Duty All-Purpose Tractor.

JUST as the tank increased the mobility of armies in battle, electric trucks have increased the mobility of armies on production lines. Old fashioned methods of materials handling proved as inadequate in meeting aviation war production schedules as the bayonet proved in meeting the tank.

In every major production center, Crescent Electric Trucks have electrified the hauling . . . lifting . . . towing . . . of war materials. World War I proved the value of Crescent Trucks to the armed forces and, today, both the Army and the Navy are using them on an increasing scale.

Peacetime materials handling, too, will flow more smoothly if electrified by Crescent. It's not too early to plan to Crescentize.

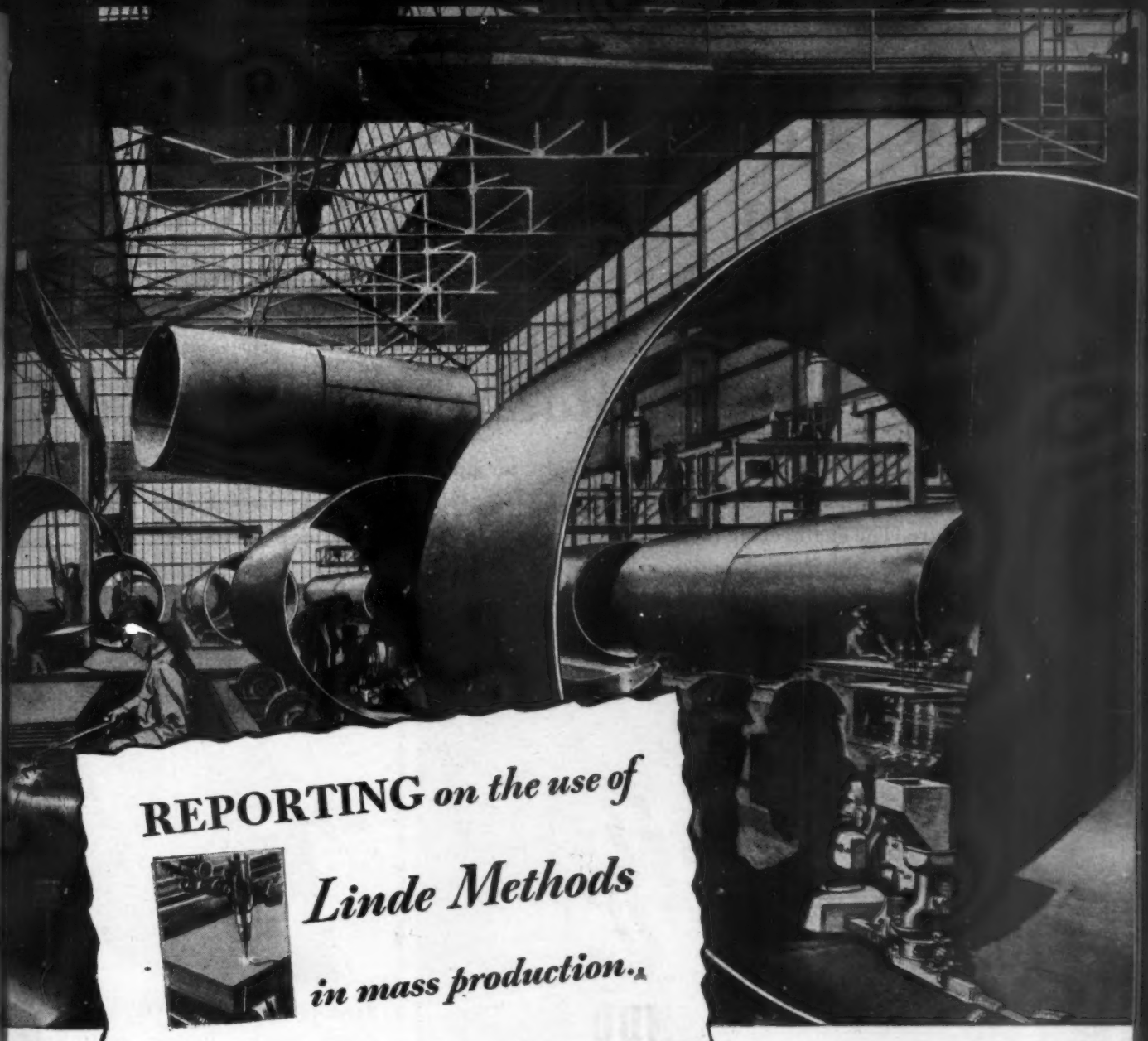
CRESCENTIZE YOUR MATERIALS HANDLING

CRESCENT TRUCKS — CRESCENT TRACTORS

CRESCENT TRUCK COMPANY

1040 Willow St., Lebanon, Penna.

Industrial Truck and Tractor Specialists for More Than 25 Years



REPORTING *on the use of*

Linde Methods

in mass production...

METAL FABRICATING ··· *if you work with metals, you should know more about these Linde Methods for* "Carpentry in Steel."

In this picture, a Unionmelt electric welding machine is joining automatically the edges of steel plate being fabricated into a pressure vessel . . . making uniformly strong welds . . . at high speed. Other Unionmelt machines . . . mounted on light, overhead cranes . . . are working on semi-finished structures further down the line.

Unionmelt welding was developed by The Linde Air Products Company. Other Linde methods . . . the "flame" methods . . . are also important to the complete picture of joining metals. Oxy-acetylene steel welding, bronze-welding, copper welding, pressure-welding, silver brazing, and other joining techniques . . . whether manually applied or mechanized . . . all have a place in the mass construction of equipment of many sizes and kinds.

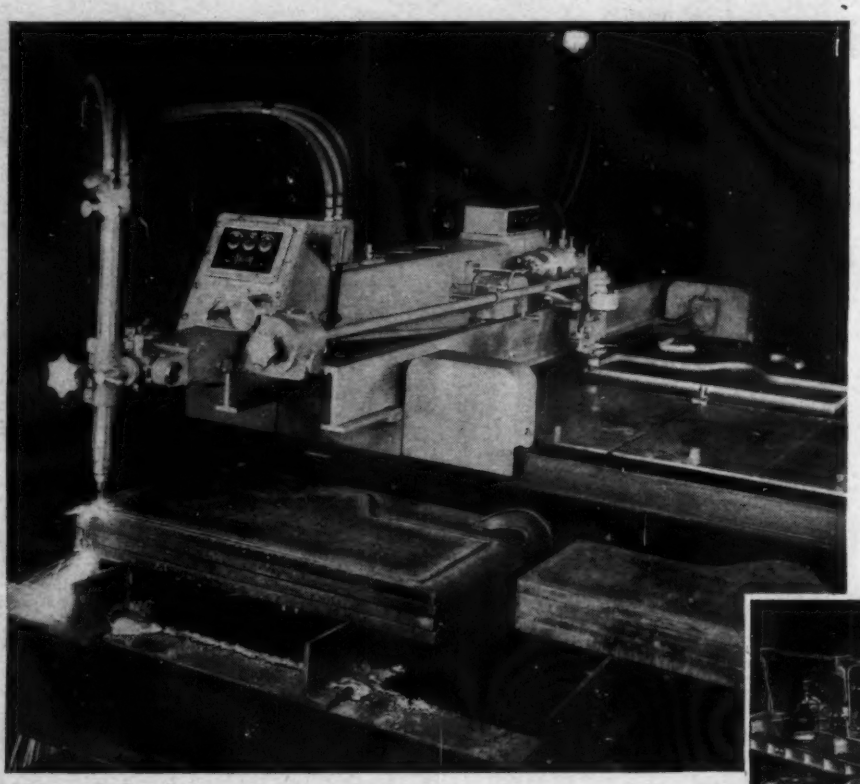
Mass production is truly a job of "carpentry in steel." Metals must be cut to size and shape . . . bent . . . formed . . . treated . . . for final fabrication. In all of these operations, Linde-developed flame processes are importantly employed.

Some applications of these flame processes are shown in the following pages. Review of them suggests the importance of keeping posted on *all* of Linde's advances in oxy-acetylene flame-fabrication . . . and of using productively, without waste, all supplies for these efficient metalworking methods.

In the Fabrication of STEEL EQUIPMENT

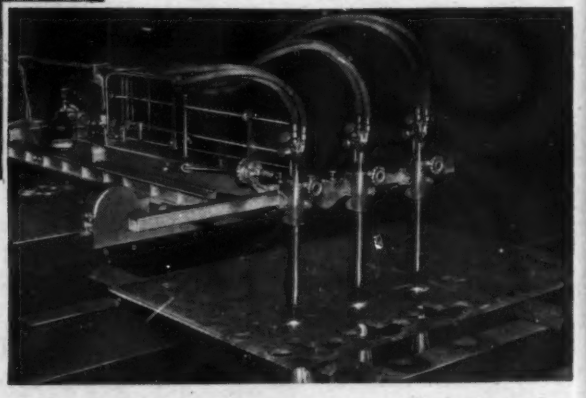
Linde Methods save Time, Power, and Materials . . .

A large part of the specialized mass production work of today is done faster, better, and at less cost by oxy-acetylene flame-techniques such as those shown here. The engineering facilities of The Linde Air Products Company helped industry to adapt these peacetime developments in efficient metalworking for today's needs. This quick review will help you to remember them . . . for tomorrow.

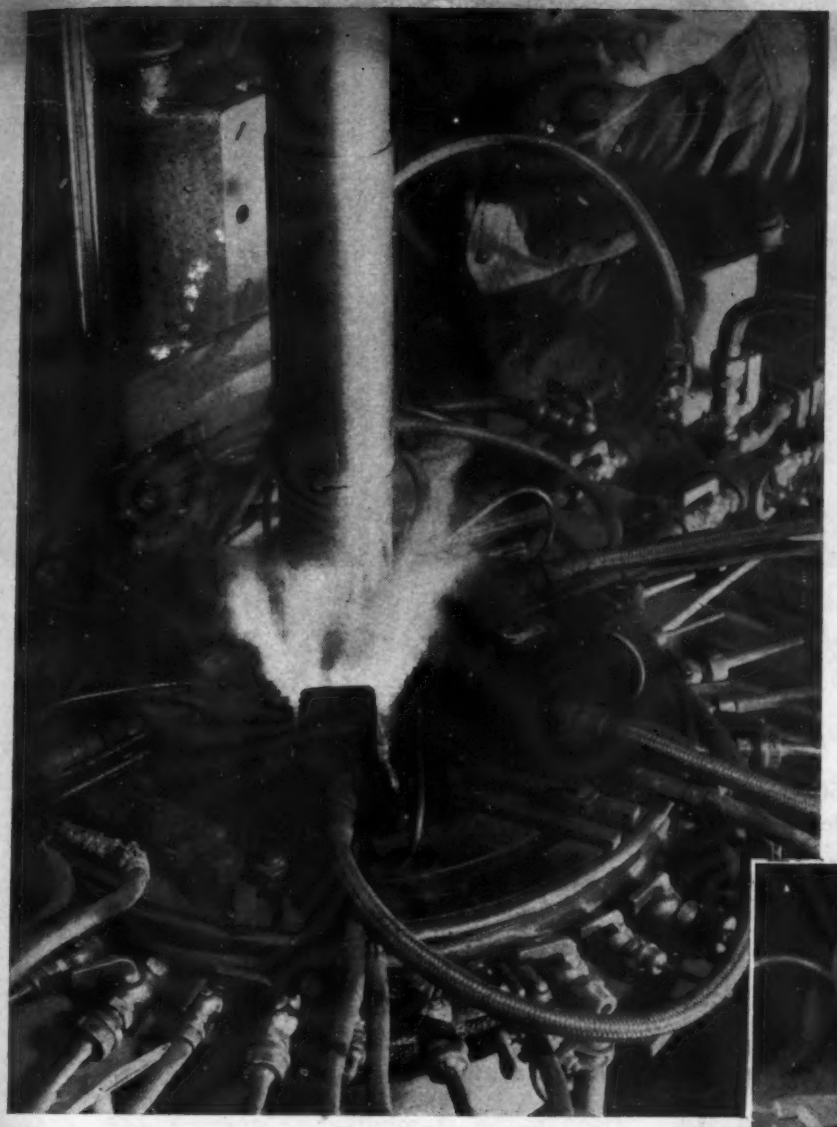


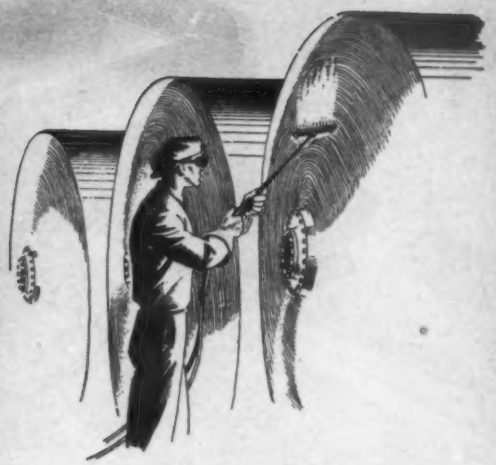
Oxy-Acetylene Flame-Cutting is a quick, "one-pass" method for shaping steel . . . in straight lines, circles, or irregular contours. Flame-cut edges are clean and smooth . . . often require no machining before use. Flame-cutting is done both with manually operated blowpipes, and with stationary or portable cutting machines. By flame-cutting, one-of-a-kind orders are easy to make up . . . design changes are simplified . . . and change-overs from parts of one shape to another require only a few minutes. In the illustration above, an Oxweld flame-cutting machine is "stack-cutting" four parts simultaneously. Shown at the right are other applications of flame-cutting.

Bending (above) — Oxy-acetylene flames provide intense, controlled heat for bending operations. Above, a pipe is being "wrinkle-bent" to produce a smooth, long-sweep turn without internal obstruction to flow.



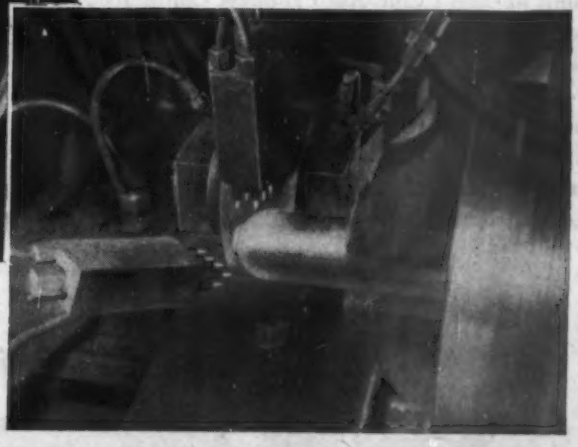
Multiple-Cutting—In some cases, when it is desired to produce numerous identical parts, several blowpipes . . . guided by a single templet . . . are mounted on the flame-cutting machine to cut simultaneously.



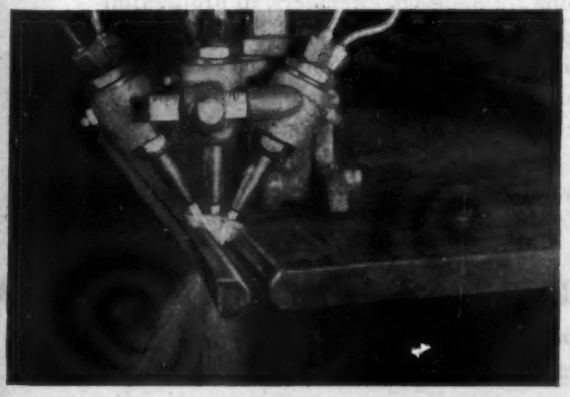


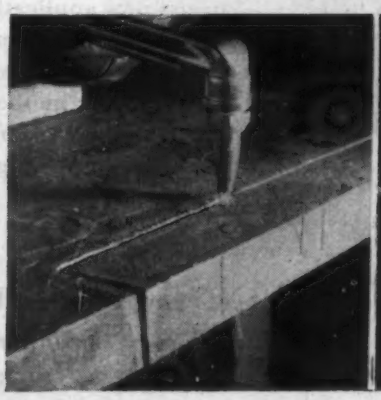
Flame-Priming (above)—Oxy-acetylene flame-priming of steel prior to painting removes loose scale, rust, moisture, oil, and grease. Paint applied to the still-warm surface bonds tighter and dries faster.

Flame-Spinning (below)—This flame-method for forming steel is used for such work as end-closure of tubing to eliminate deep-drawing operations.



Flame-Hardening (above)—Oxy-acetylene flame-hardening imparts a hard case to steel and iron parts without affecting the toughness of the core. Parts can thus be made of less costly base metals selected for core properties, and then protected against wear by flame-hardening surface areas.

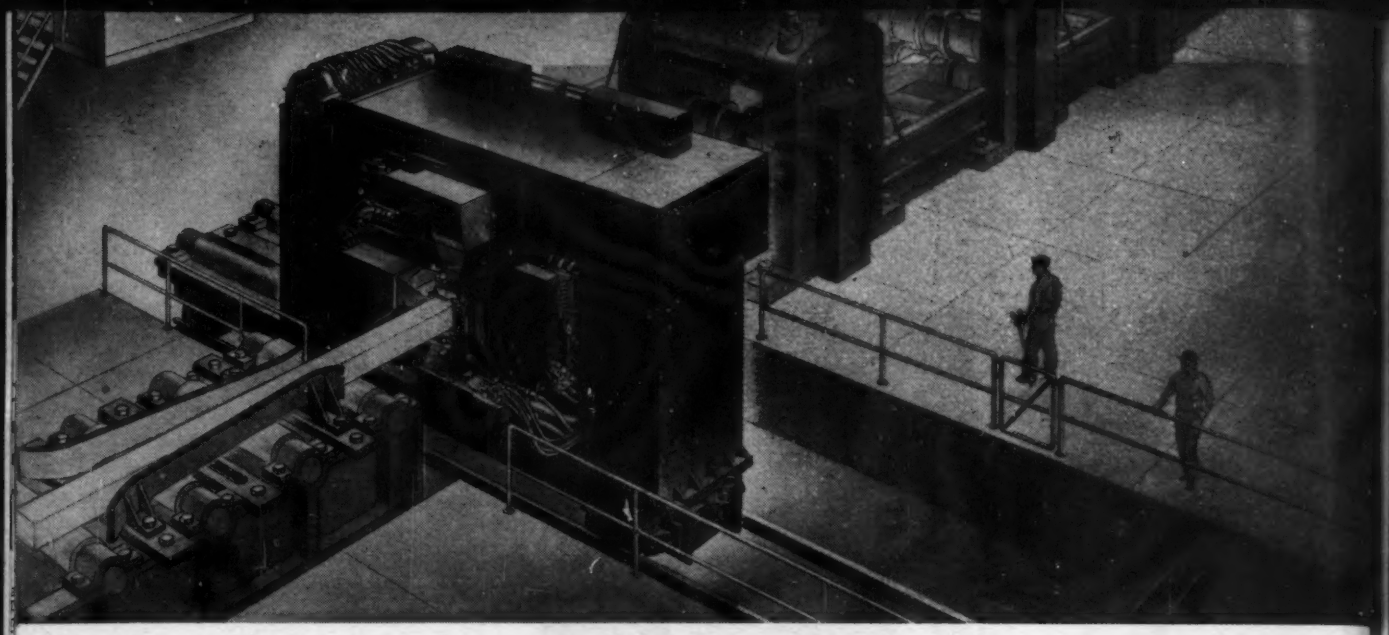




Flame-Planing—Mechanized flame-cutting in several planes simultaneously is a quick and economical way to prepare plate edges for welding. Accuracy of the cuts is comparable to results obtained by using more costly, mechanical methods.

Hand-Operated Cutting Blowpipes (above) are useful for many jobs. When used with gouging nozzles (above, right), a groove can be made quickly in a metal surface.

For more information on Linde methods, please turn the page.



MECHANIZED FLAME-SCARFING ...*helps produce* BETTER STEEL...*faster!*

Mechanized oxy-acetylene flame-scarfing of semi-finished steel is an important engineering development of The Linde Air Products Company . . . important to both the steelmaker and the fabricator because it helps to produce better steel . . . faster!

Through use of Linde-developed oxy-acetylene scarfing machines like that shown here . . . installed right in the steel mill production line . . . faulty surfaces are "skinned" from the hot steel as it rolls through . . . and a higher yield of quality steel is obtained without interruption of production.

For some special steels, such as armor plate slabs, surface removal is accomplished after the steel has cooled . . . partially or completely . . . and been removed from the roll table. This is done by Linde machines that move along the slab. Where mechanized conditioning of steel is not feasible, or for secondary conditioning, oxy-acetylene deseaming is done quickly and economically with Linde's manually operated scarfing equipment.

This BOOKLET *will tell you more about Linde* METALWORKING METHODS

The booklet shown here will be of interest . . . and may suggest new applications . . . to design engineers, to production and maintenance men, to oxy-acetylene process supervisors, and to welding foremen. It describes Linde's oxy-acetylene metalworking methods, and shows the catalogs that you can obtain to aid in your selection of the apparatus and supplies needed for applying these processes. As many copies as you require will be sent without cost by any Linde sales office.

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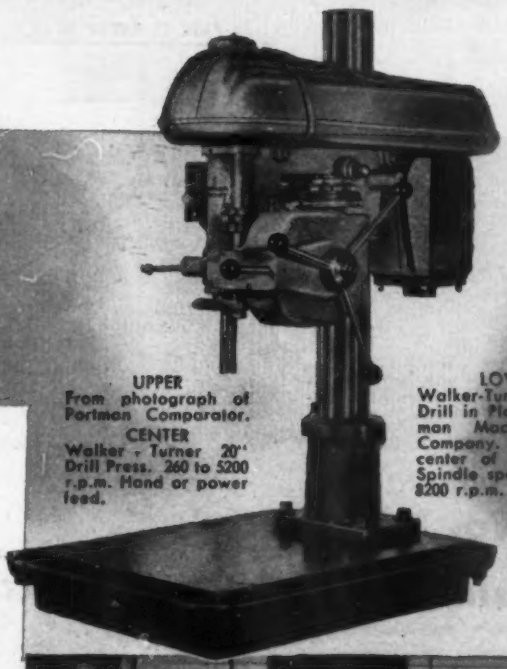

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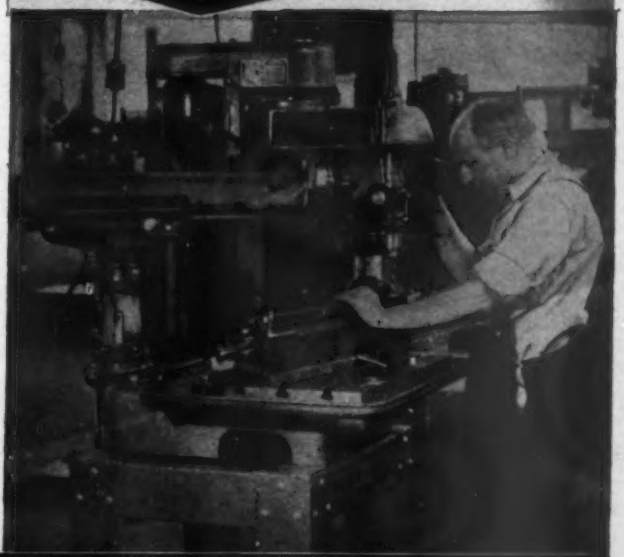

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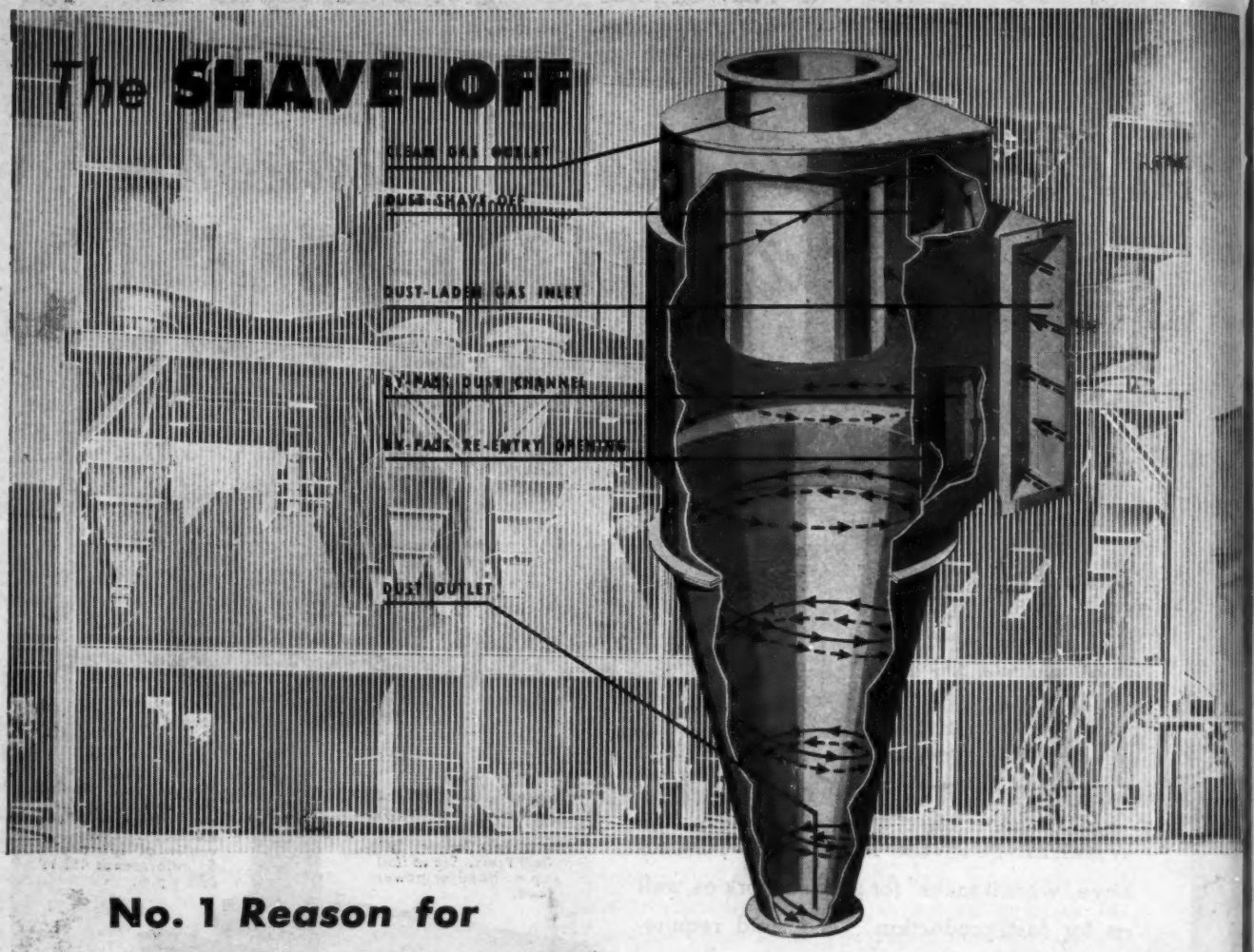

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Any engineer will find convincing substantiation for these claims in Buell's factual, 28-page book mentioned above. You may obtain a copy by writing for Bulletin G-842.

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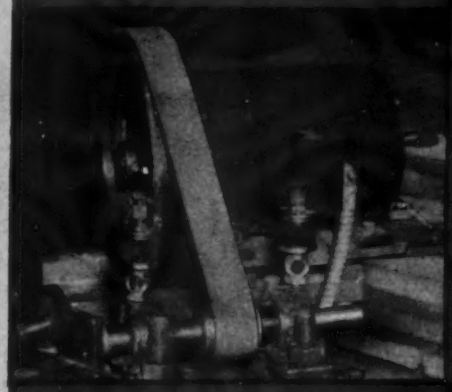
◀ (Left) GILMER V-BELTS: Space-saving, silent, shock-absorbing belts, built to lock in the grooves with a nonslip grip. Made in standard and special sizes.



(Right) GILMER HEVALOID ENDLESS BELTS: Made under the Hevaloid patent with Neoprene compound that provides high coefficient of friction. For precision work at top speed of 9000 f.p.m. Resists oil, heat, stretch and slippage. ▶

◀ (Left) GILMER SPEEDAGE BELTS: Very light, lapless, flat, fabric belts for high speeds to 10,000 f.p.m. and over. Assures chatterless production.

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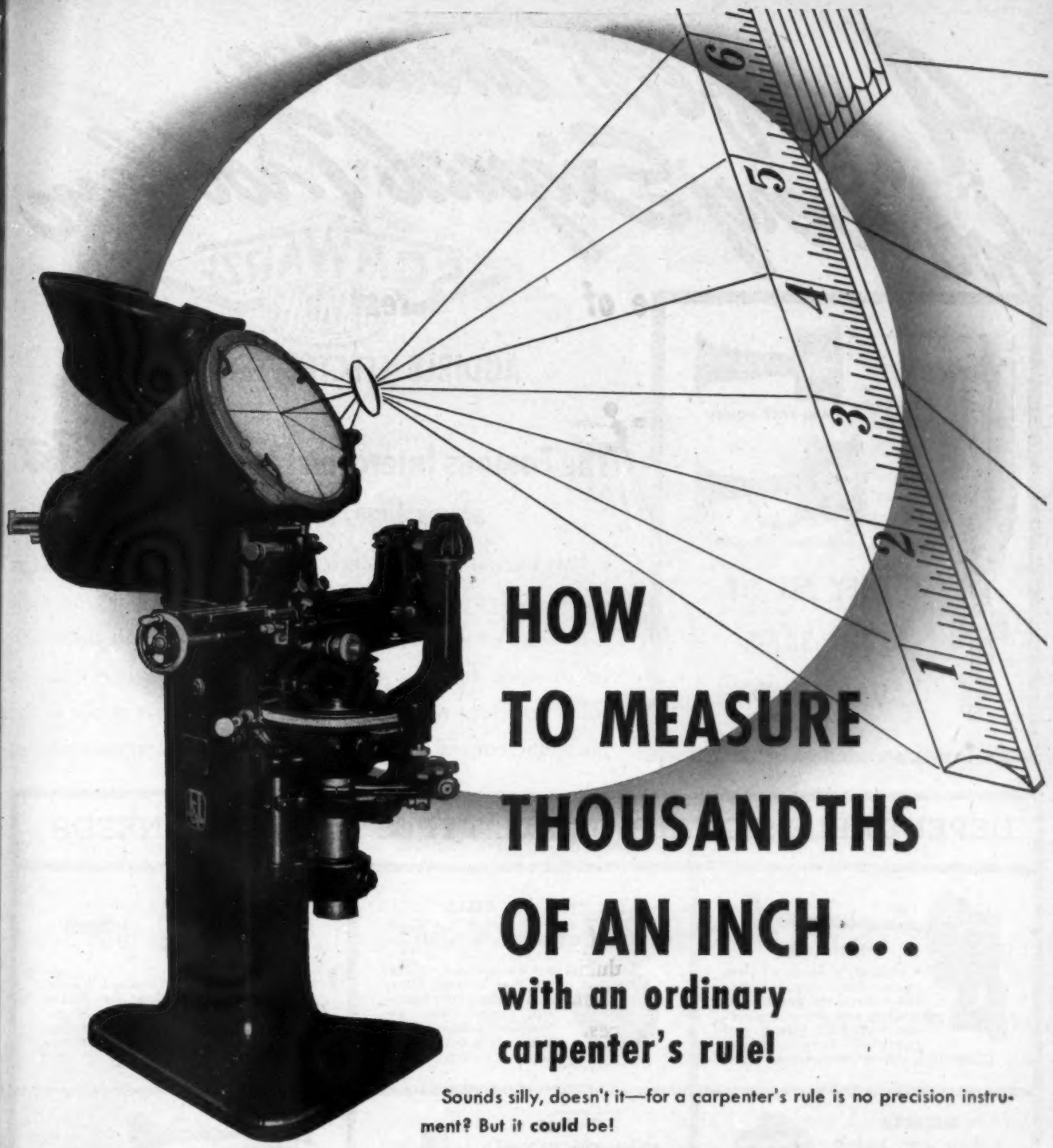

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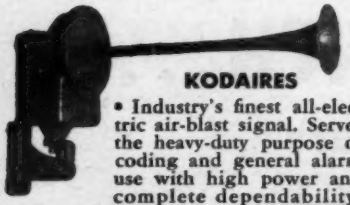

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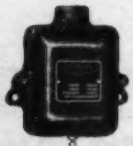

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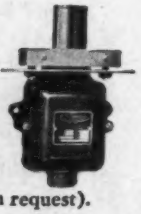

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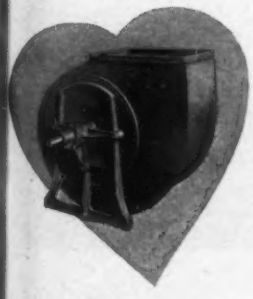

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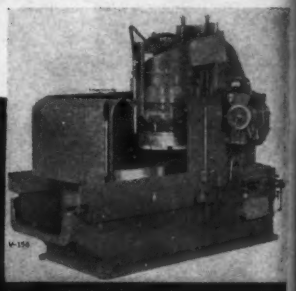

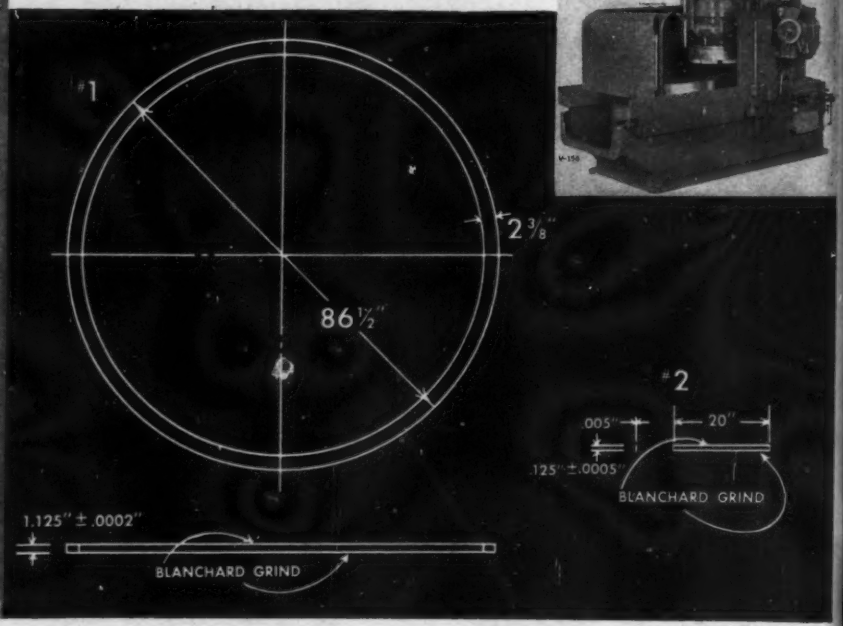

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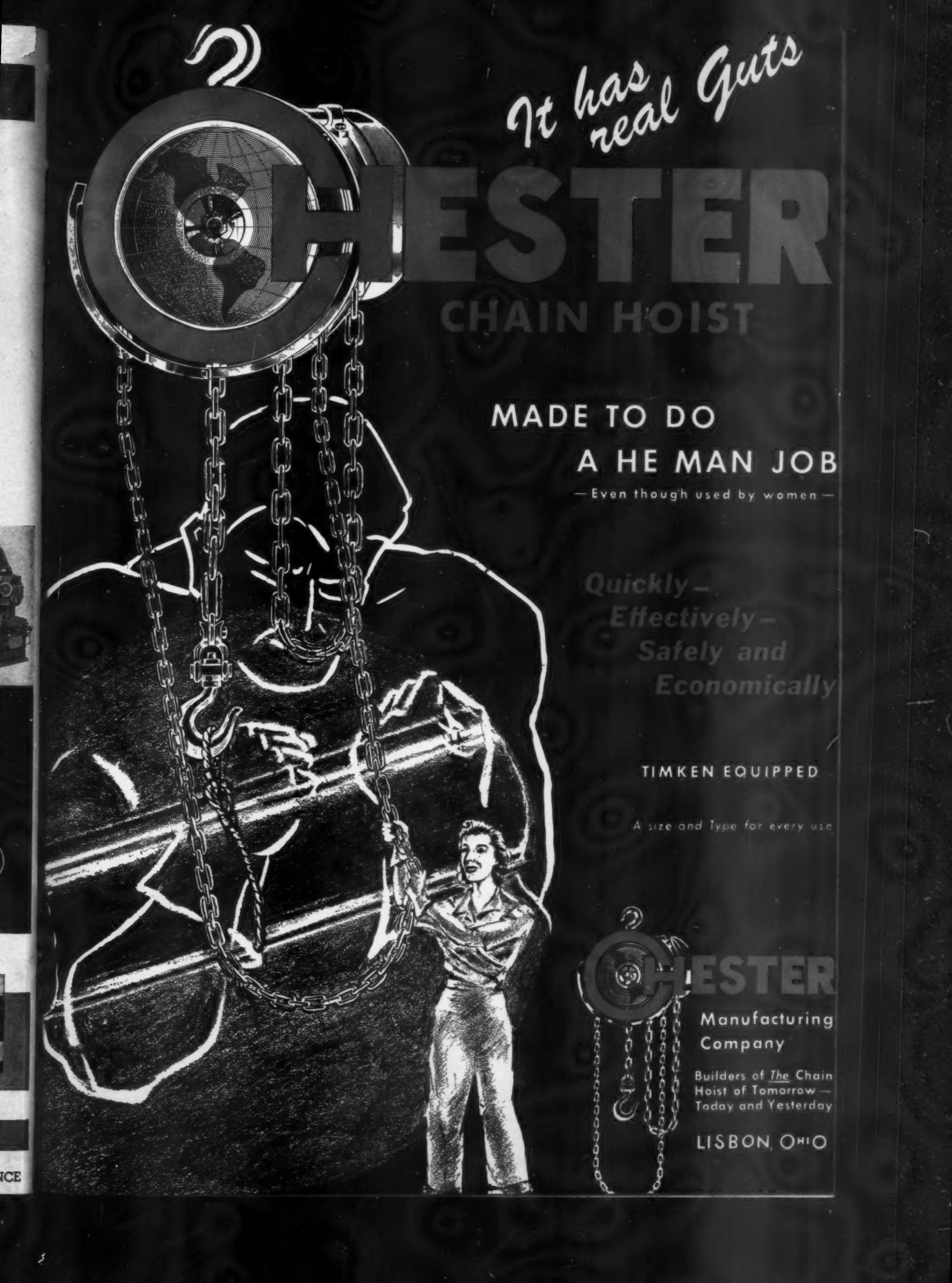
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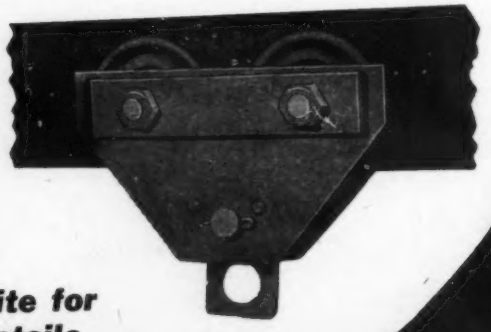

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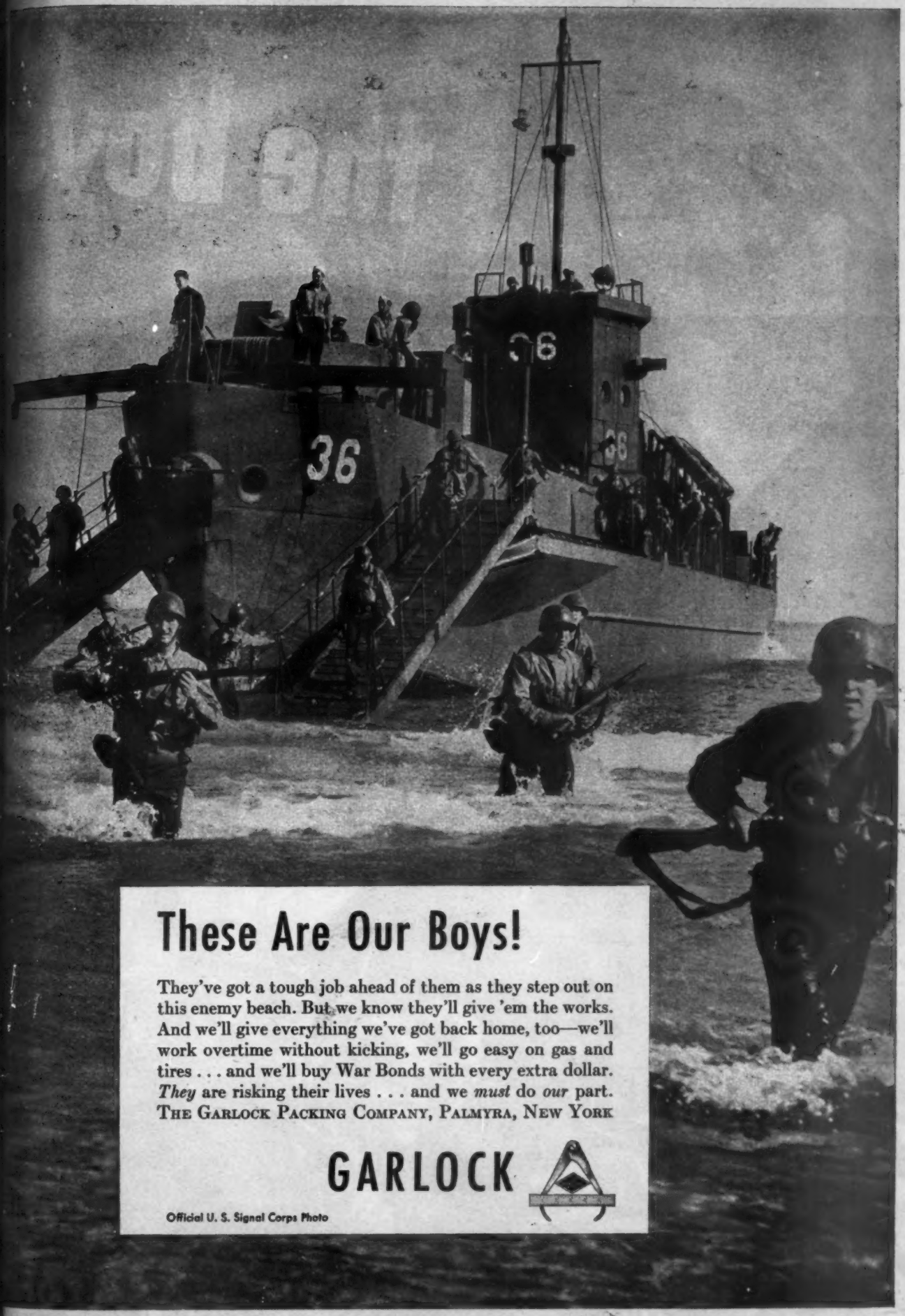

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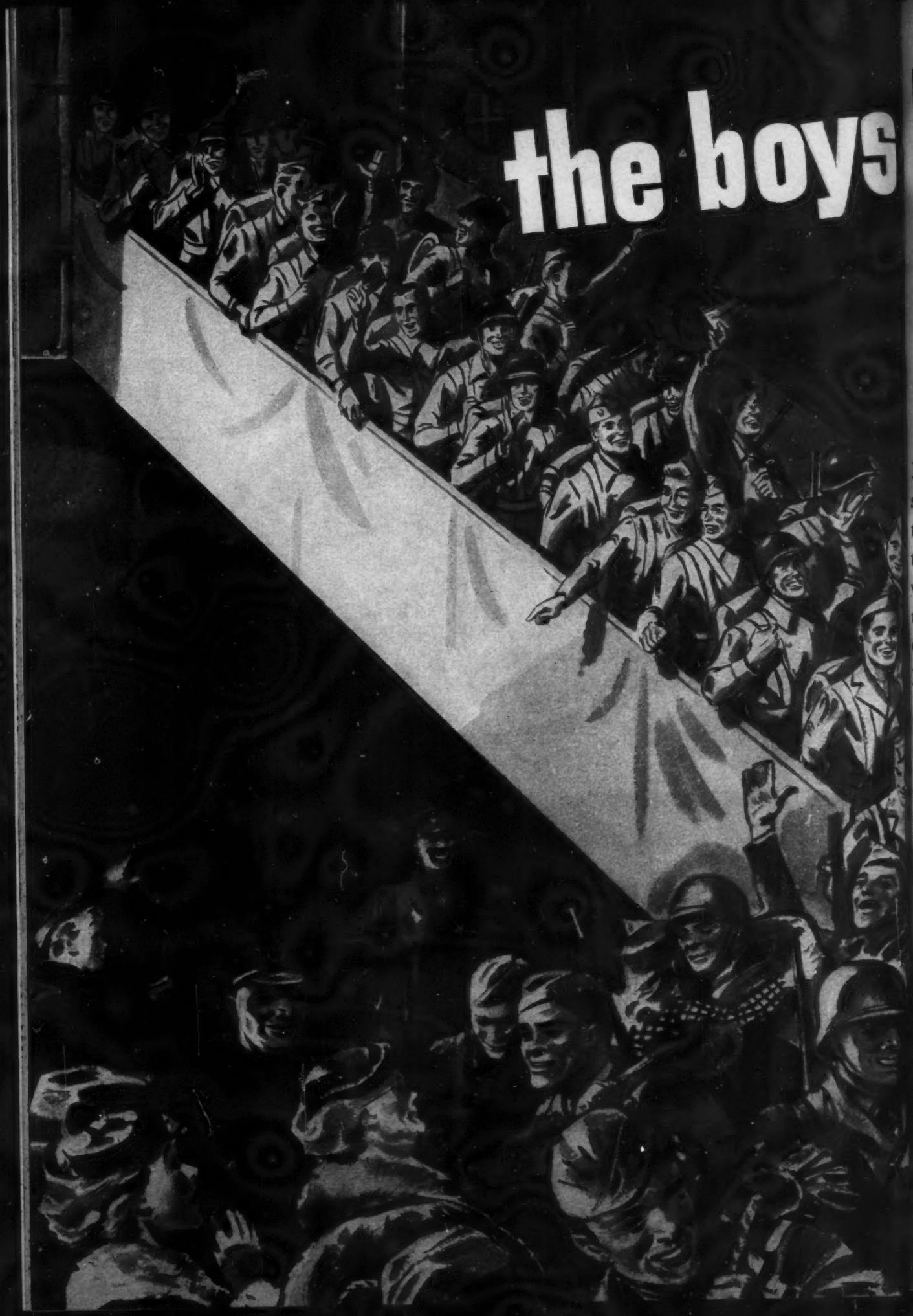
GARLOCK

Official U. S. Signal Corps Photo


the boys

...s have landed . . .

Mr. Business Executive, you are a four-star general when this war ends. It is up to you to have the jobs for our boys, then. They have fought and will have won this war . . . but with "cease firing" they will look to you for their peacetime commands. Will you be ready? Is your plant and your sales organization ready to absorb the shock of rightful invasion by the returning hordes of Americans? Nine million American men and women returning to the civilian way of life! Think ahead, Mr. Business Executive, to the time when you again will have to make the decisions and give the orders. When the sales battle is once again how to whip competition. When markets are measured in customers rather than in government contracts. When production at any cost becomes production at lowest cost. To turn a profit, then, we suggest you turn to LeBlond now . . . it's time to retool for "peacework".

R.K. LeBLOND **MACHINE TOOL CO., CINCINNATI, 8**

NEW YORK 13, 103 Lafayette St. CAnal 6-5281

CHICAGO 6, 20 N. Wacker Dr. STA 5561

Check-Clip-Mail

FOR ILLUSTRATED SPECIFICATIONS:

- ☐ HEAVY DUTY GEARED HEAD ENGINE LATHES
- ☐ TOOL ROOM LATHES
- ☐ AUTOMATIC LATHES
- ☐ HEAVY DUTY GEARED HEAD GAP LATHES
- ☐ SUPER REGAL GEARED HEAD LATHES
- ☐ RAPID PRODUCTION LATHES
- ☐ AUTOMATIC CRANKSHAFT LATHES
- ☐ No. 2 CUTTER GRINDER

YOUR NAME _____ TITLE _____

YOUR FIRM _____ ADDRESS _____

...ime to retool

Turn to LeBlond for Turning Equipment

LARGEST MANUFACTURER OF A COMPLETE LINE OF LATHES

★ YOUR BONDS BUY BOMBS ★

BUY A "BLOCK-BUSTER" TODAY!

...Lathes—Nine sizes ...m 12" to 50" swings. ...atility in turning.

Automatic Lathes—12" & 16" Mechanical or Hydraulic power.

Super Regal Lathes—Six sizes, 13" to 24" Best for training.

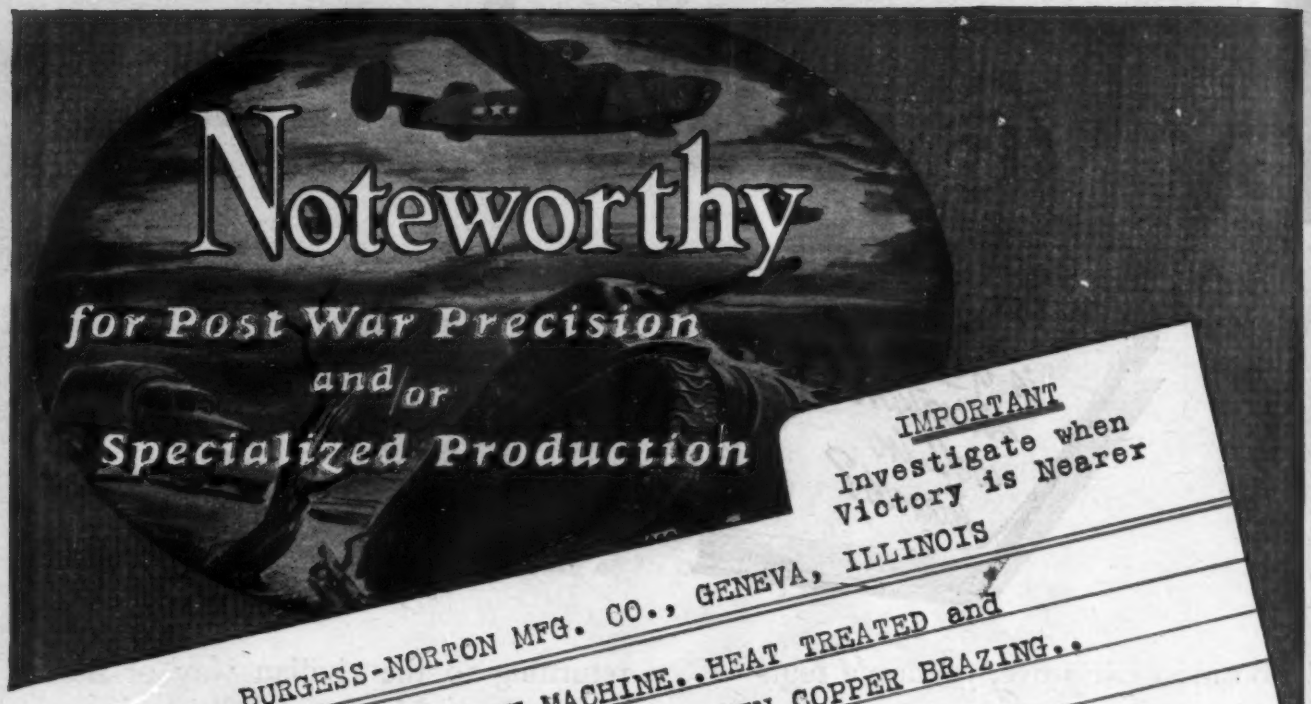
Automatic Crankshaft Lathes—For all facing, turning, finishing, pins.

Tool Room Lathes—12", 14", 16" and 18" swings. Versatile.

HD Gap Lathes—Ten sizes in Regular and Sliding Gap models.

Rapid Production Lathes—13", 17", 20" swings. Six speeds. Faster output. Lower cost.

No. 2 Cutter Grinder—Internal, cylindrical, face and angular work.



Noteworthy

for Post War Precision and/or Specialized Production

IMPORTANT
Investigate when Victory is Nearer

BURGESS-NORTON MFG. CO., GENEVA, ILLINOIS

PISTON PINS..SCREW MACHINE..HEAT TREATED and GROUND STEEL PRODUCTS..HYDROGEN COPPER BRAZING.. NON-PRECISION BALL BEARINGS

This 40 year old metal working manufacturer really knows how to turn out precision production. Their war work includes accuracy to the nth degree..finishing to 2 micro inches..heat treating to the most exacting specifications ..and some mighty interesting developments in Hydrogen Copper Brazing that we may utilize to advantage. Have completely equipped metallurgical laboratories, engineering department..most modern testing equipment..largest Brazing furnaces in middle west..complete manufacturing facilities and men with the Know How.

A Part is never made right unless it is satisfactory to our customers.

ARMY NAVY

Burgess Norton
MANUFACTURING COMPANY
40 years in GENEVA, ILLINOIS

Can you think of 7 better reasons for installing MILLER Fluorescent now?

Here are provable facts—facts that have caused war industry to insist upon MILLER 50 & 100 FOOT CANDLER Continuous Fluorescent Lighting Systems . . .

1 NEW, IMPROVED DESIGN of the Miller Continuous Wireway Flourescent Lighting System, constructed to comply with wartime regulations for conservation of critical materials —the same as introduced in 1939.

2 RUGGED LIGHTWEIGHT EQUIPMENT —rigid compact channels and Masonite reflectors—no reduction in lighting efficiency.

3 EXPOSED BALLAST for coolest possible operation—all wiring concealed but accessible upon removal of lightweight reflector.

4 LAMPHOLDERS rigidly mounted back-to-back for mutual stiffening and maintenance of spacing. Miller patented lamp lock also available, minimizing danger of falling lamps.

5 LOW INSTALLATION COST — savings of 30-50% again possible by use of 8 foot and 10 foot rugged double length channels—one suspension per channel section—simplified wiring in continuous rows.

6 SIMPLIFIED MAINTENANCE—ballasts, lampholders and starters readily accessible — starters located between lamps.

7 UNIFORM ILLUMINATION—the 30 to 50 or more footcandles required for war production easily obtainable from practical row spacings.

We suggest you write or wire today for complete information.

THE MILLER COMPANY • MERIDEN, CONNECTICUT

ILLUMINATING DIVISION
Fluorescent, Incandescent
Mercury Lighting Equipment

OIL GOODS DIVISION
Domestic Oil Burners
and Liquid Fuel Devices

ROLLING MILL DIVISION
Phosphor Bronze and Brass
in Sheets, Strips and Rolls

WAR CONTRACTS DIVISION
War Material

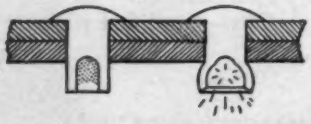
MILLER
SINCE 1844

Your future is linked with the

ERA OF ELECTRONICS

HK-257

High-Speed Riveting with ELECTRONS and DYNAMITE



Backing up rivets inside small structures presented a difficult problem until dynamite-filled, heat-detonated rivets were developed. The first detonator was a slow soldering-iron device, but today an electron "gun" allows one man or woman to set from 20 to 40 rivets a minute!

The electron riveter shoots high-frequency current into the rivet, almost instantly raising the temperature of the powder to the detonating point.

Does this example of electron tubes at work give you an idea how Gammatrons can speed your industrial production? It's something to think about....something to consider for the future.

Meanwhile Gammatrons have an important military mission to perform before the day comes when they will put the very high frequencies to work for the widespread betterment of industry and mankind.

HEINTZ AND KAUFMAN LTD.
SOUTH SAN FRANCISCO • CALIFORNIA

Gammatron Tubes

HK-257 (Illustrated above)—Highly popular Gammatron beam pentode of advanced design, made with tantalum elements. It has high voltage and power capabilities, and requires very little driving power. It offers long life, can withstand heavy overloads, and is remarkably efficient at both radio and very high frequencies. Plate dissipation, 75 watts; power output, 225 watts.

What's Behind the Trade Mark?

QUALITY

TRADE MARK

YOUNGSTOWN

SERVICE

A 1923 Investment in Quality and Service

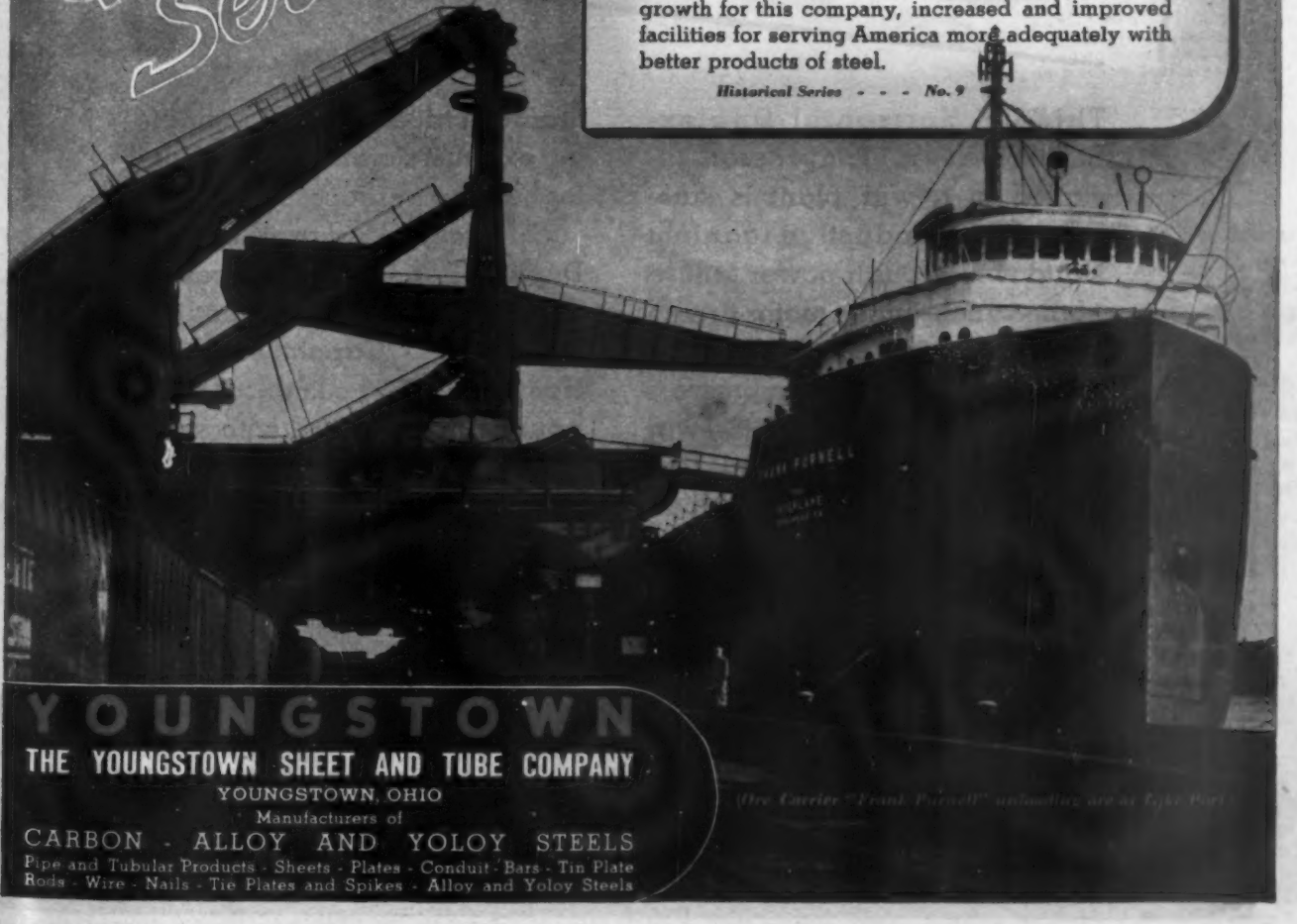
STEEL company mergers were the talk of the twenties and thirties. The Youngstown Sheet and Tube Company had its full share in these proposals and discussions.

Early in 1923 came the only "merger" in Youngstown's history -- the entire assets of the Brier Hill Steel Company and the Steel and Tube Company of America, totaling approximately $85,000,000 were acquired. It took a $50,000,000 bond issue and a stock increase of $65,000,000 to finance these deals and provide money to consolidate and round out these three great properties into one soundly coordinated manufacturing organization. Only in a *free* economy could such a venture succeed.

Through this move Youngstown acquired many of the important resources that enable it to serve America so well today -- valuable ore, coal, zinc and limestone mines, modern manufacturing plants with desirable frontage on Lake Michigan, and a second well integrated group of plants in the Youngstown district. This expansion served also as a further spur to the program of keeping production facilities abreast of the times--with a new sheet mill at Brier Hill, a new blast furnace and two new tube mills at Indiana Harbor. As the 1923 annual report stated, greater advancement had been made in two years in improved methods and machinery than had been effected in the previous ten years.

So it has gone for over 40 years! Each successive step up the path of private enterprise has meant growth for this company, increased and improved facilities for serving America more adequately with better products of steel.

Historical Series - - - No. 9



YOUNGSTOWN

THE YOUNGSTOWN SHEET AND TUBE COMPANY

YOUNGSTOWN, OHIO

Manufacturers of

CARBON - ALLOY AND YOLOY STEELS

Pipe and Tubular Products - Sheets - Plates - Conduit - Bars - Tin Plate
Rods - Wire - Nails - Tie Plates and Spikes - Alloy and Yoloy Steels

Another CP Steam-Driven Compressor GUARDS AGAINST POWER FAILURE

This CP Horizontal Duplex, Steam-Driven Compressor, installed in a war plant is safeguarding production against shutdown through power failure of the synchronous motor-driven CP Compressor installed with it.

CP Steam-Driven Compressors are playing their part in the war effort . . . protecting vital war plants against interruption of air supply due to power line failure . . . efficiently utilizing boiler capacity where it is more plentiful than electrical current . . . providing exhaust steam where needed for heating or process work.

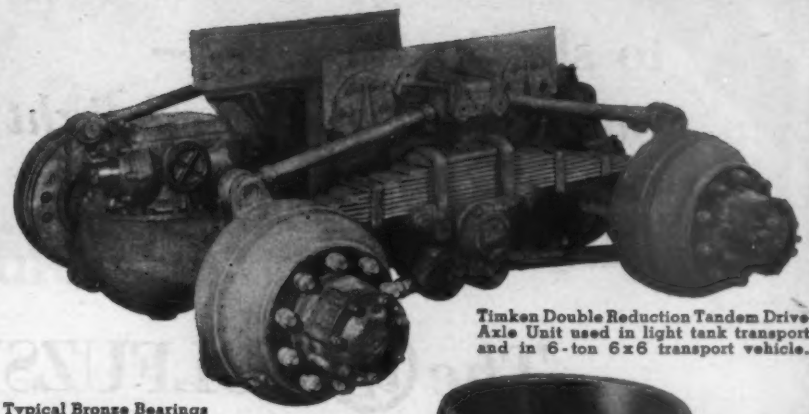
CP Steam-Driven Horizontal Duplex, Two-Stage Compressors are ideal for large and medium-size plants. Capacities range from 400 to 6600 c.f.m., 100 to 125 pounds air pressure with steam cylinders available for a wide range of steam conditions. Other sizes in single and multi-stage design for lower and higher pressures. Write for literature.

★★★★★★★★★
PNEUMATIC TOOLS
ELECTRIC TOOLS
(Hicycle...Universal)
ROCK DRILLS

CHICAGO PNEUMATIC
TOOL COMPANY
General Offices: 8 East 44th Street, New York 17, N. Y.

★★★★★★★★★
AIR COMPRESSORS
VACUUM PUMPS
DIESEL ENGINES
AVIATION ACCESSORIES

AXLES of War



Timken Double Reduction Tandem Drive Axle Unit used in light tank transport and in 6-ton 6x6 transport vehicle.

Typical Bronze Bearings used in Timken Axle applications.

Timken Double Reduction Tandem Drive Axle Unit used in medium tank transport.

This Bunting catalog lists many sizes of finished bearings available from stock for axles and shafts and all industrial machinery applications. Write for it.

● Much of the rolling load of the Allied offensive is carried on Timken-Detroit Axles fitted with massive Bunting Bronze Bearings. Practically all types of automotive vehicles used in the war are so equipped to assure dependability in performance under the terrific stresses and shocks to which such units are subjected.

Cast Bunting Bronze Standardized Bearings are available from stock, completely machined and finished in many sizes for all axles and shafts, machine tools, electric motors, industrial machinery of all kinds. Bunting Bearing Bronze Bars are machined I.D., O.D. and Ends. Ask your wholesaler. Write for catalog giving complete specification data. The Bunting Brass & Bronze Co., Toledo, O. Warehouses in Principal Cities.

Bunting

BRONZE BUSHINGS • BEARINGS • PRECISION BRONZE BARS

It's Easy

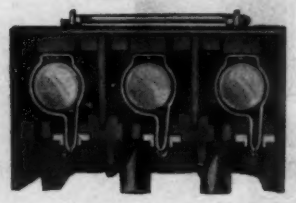
to slip in the fuses— but they're *clamped tight* for perfect contact . . .

Fuse clamp switch blades open slightly when fuse is inserted. This results in a tight clamping contact when fuse clamp switch blades are inserted in switch contact slots.

Fuses slide easily and quickly into place. No adjustment necessary

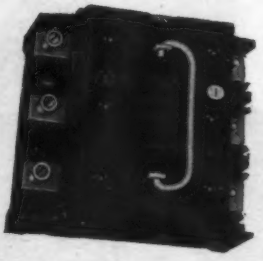
The FA PULFUZSWITCH

insures against loose contacts and resultant overheating . . . The fuse-holding switch blades are so designed that the placing of the fuse carrier into the ON position of the switch automatically *clamps the fuses tight* . . . At the same time, the switch blades make *pressure contact* with the fixed switch parts, insuring full current carrying capacity. . . . These photographs show how this is accomplished.



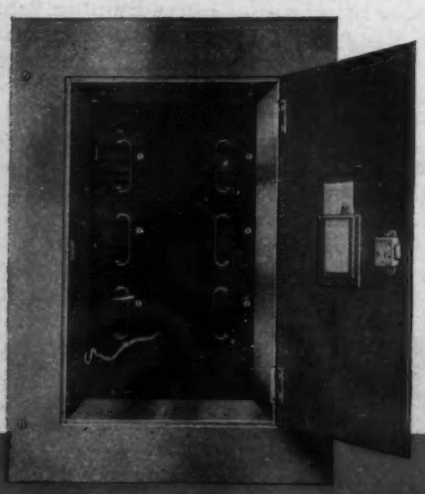
Note how fuse clamp switch blades, in ON position, make pressure contact with switch contact slots in the base. This draws the tips of the switch blades together, and pulls fuse clamps tightly around fuse ferrule. Contact parts are silver plated, for low resistance and long life. Bakelite barriers isolate each fuse in an individual compartment.

Each unit is equipped with FA solderless type pressure connectors; visible ON and OFF indicators; ventilating holes in fuse carrier; contacts for bus or cable integral with contact slot member, and pull handle for reversing switch.



FA PULFUZSWITCH units are made in 30, 60 and 100 ampere capacities, for 250 volts or less; also 30 and 60 ampere, 600 volts. They are assembled into panelboards (with either single or double row of branches) for all types of feeder systems. 60 ampere branches are convertible to 30 ampere—a desirable convenience for heat and power service.

Boxes are of galvanized steel. Wide gutters and FA Pressure type (Solderless) Connectors expedite wiring. Fronts are rustproofed, and attractively finished in pearl gray. Available for both surface and flush mounting . . . For further information, write Frank Adam Electric Company, Box 357, St. Louis, Mo.



FA Pulfuzswitch Panelboard, double branch, with 60 amp. 3 pole branches.

EST. 1891 — THE SIGN OF A FA BETTER JOB

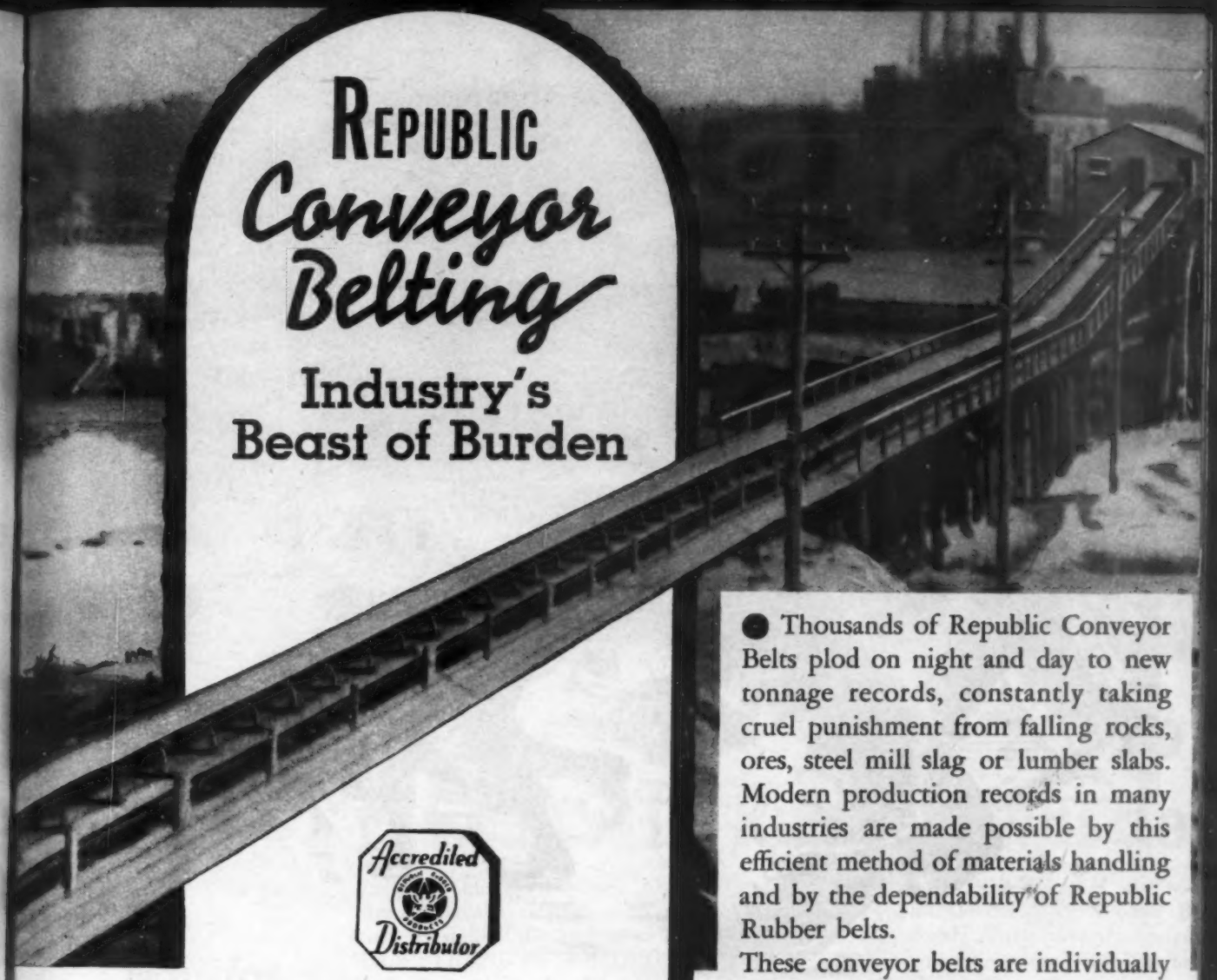
Frank Adam

ELECTRICAL PRODUCTS

for War Industry

FRANK ADAM ELECTRIC CO.
ST. LOUIS, MO. U.S.A.

REPUBLIC
Conveyor Belting
Industry's Beast of Burden



● Thousands of Republic Conveyor Belts plod on night and day to new tonnage records, constantly taking cruel punishment from falling rocks, ores, steel mill slag or lumber slabs. Modern production records in many industries are made possible by this efficient method of materials handling and by the dependability of Republic Rubber belts.

These conveyor belts are individually engineered for the job, and are built to absorb shocks and heavy loads on long or short hauls. Your Republic Distributor is carefully chosen and through close factory cooperation is qualified to consult with you on proposed installations.

Accredited Distributor

INDUSTRIES USING REPUBLIC CONVEYOR BELTS

Coal • Steel • Copper • Aluminum • Quarrying and Aggregates • Chemical • Lumbering • Construction • Paper • Cement • Petroleum Refining • Engineering Projects • Utilities • Metal Fabrication • Shipping • Warehouse Storage • Canning and Food Processing Tile and Ceramics

WE ARE PARTICIPANTS IN THE OWNERSHIP AND OPERATION OF NATIONAL SYNTHETIC RUBBER CORPORATION

REPUBLIC RUBBER

YOUNGSTOWN 1 • • OHIO

HOSE • BELTING • MOLDED GOODS PACKING • EXTRUDED PRODU

DIVISION OF

LEE RUBBER & TIRE CORPORATION

WHY EXTRA SCRAP IS NEEDED AGAIN!

The morning news flash reads: "Another beachhead was established. . ."

Sounds matter-of-fact, doesn't it? Yet back of every successful new landing are weeks—even months of preparation. Thousands of troops must be trained; thousands of tons of steel fighting equipment must be ready.

Steel must provide the spearhead and protect precious lives. But the plain fact is *there won't be enough steel* unless American plants overcome the normal "winter lag" in scrap collections. It is estimated that an additional *15 million tons of scrap* will be required.

This is not an appeal for the ARMCO furnaces alone. Actually, every steel mill in the country must go full blast all winter if military requirements are to be met. And the only assurance of this will be a flood of millions of tons of *extra* scrap.

You "did the job" last winter. This year, with a second front in view, the need is even more critical. Get your salvage committee back in action. Collect everything that doesn't serve a useful purpose. Separate the ferrous and non-ferrous metals and then call the scrap dealer.

Remember, every ton of scrap you collect will help win a battle —*and save lives.* The American Rolling Mill Company, 381 Curtis St., Middletown, Ohio.

ARMCO

FOR EXPORT: THE ARMCO INTERNATIONAL CORPORATION

TURN IN ALL YOUR SCRAP

MANHATTAN
CONDOR V-BELTS
Whipcord construction gives flexibility, strength and extreme lack of stretch.
HOMOCORD
Homogeneous and cushioned Strength Members provide free-flexing of Conveyor Belts over pulleys and easy troughing on idlers.
STRENGTH
MEMBERS

. . . are the *SINEWS* o
FLEXLASTIC* Rubber Muscle

Just as the sinews hold together and strengthen the muscles without limiting their freedom of movement, so MANHATTAN STRENGTH MEMBERS reinforce and strengthen the FLEXLASTICS*, at the same time that they enhance their flexibility and durability.

MANHATTAN STRENGTH MEMBERS are "engineered," each one for a specific service, fabricated and scientifically located in the precise area or section where they contribute the most to structural life and capacity—just as in engineering design of bridges or trusses. Members of suitable materials, correctly proportioned and treated, are properly placed with respect to all other component parts.

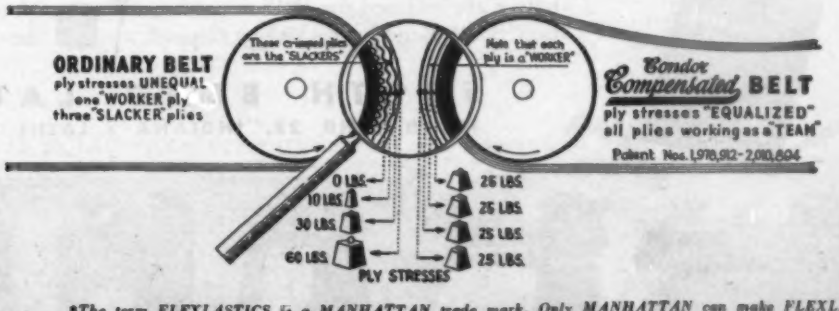
Examination of the diagram below ordinary and Condor Compensated Be illustrates clearly what correctly designe strength members accomplish in perfor ance, longer life and notably lower ultima cost of power transmission. It is an econon which extends beyond the belt itself, bearing and machine and to uninterrupte production.

Similar advantages result from a long li of exclusive MANHATTAN development such as the Homocord principle for Co veyor Belts; Condor Whipcord Endle Belts with Extensible Tips; Condor Whi cord V-Belts; Homoflex Hose in air, wate spray and other types; MANHATTA Fire Hose with Radio-Active Milde Proof Treated Jackets, and many othe

Condor PRODUCTS

- Conveyor and Elevator Belt
- Compensated Belt
- Transmission Belt
- V-Belt
- Air Hose
- Contractors Hose
- Fire Hose
- Hydraulic Hose
- Oil and Gasoline Hose
- Sand Blast Hose
- Steam Hose
- Suction Hose
- Water Hose
- Chute Lining
- Launder Lining
- Industrial Brake Blocks and Lining
- Molded Rubber Goods
- Rubber Lined Tanks
- Rubber Covered Rolls

- Abrasive Wheels
- Bowling Balls



*The term FLEXLASTICS is a MANHATTAN trade mark. Only MANHATTAN can make FLEXLASTIC

51st YEAR OF RESEARCH

The record of the first 50 years of accomplishment is the pledge for the second half-century MANHATTAN is now entering with research, testing, care and inspection as a basic policy, so there may be unbroken continuity to its contribution to industry. It will always be sound policy to keep ahead with MANHATTAN.

KEEP AHEAD WITH MANHATTAN

THE MANHATTAN RUBBER MANUFACTURING DIVISIO
of RAYBESTOS-MANHATTAN, INC.

South Bend Lathe Works
POST-WAR PRIORITY CERTIFICATE
NUMBER 1,552
This is to Certify that the South Bend Lathe Works has received Your Order No.
SOUTH BEND LATHE WORKS

Be First ON THE POST-WAR PRIORITY LIST

Post-war employment and prosperity depend upon quick resumption of normal peace time civilian activities, production, and services. To furnish lathes first to those who will be ready to use them (but cannot qualify for a war-time priority) South Bend Lathe Works now offers a practical post-war priority plan.

To take advantage of this plan, place an order now for the lathes you want. No down payment, no deposit is required. Should conditions necessitate, you may cancel the order at any time. All we ask is that it be placed in good faith.

When your order is received, we will issue a numbered Post-war Priority Certificate. As soon as materials and manpower are released for civilian production, South Bend Lathes will be shipped in accordance with the Priority Certificates. Certificate holders will receive the first South Bend Lathes to be thus released, up to 80% of our production. The remaining 20% will be reserved for returning service men who may need lathes.

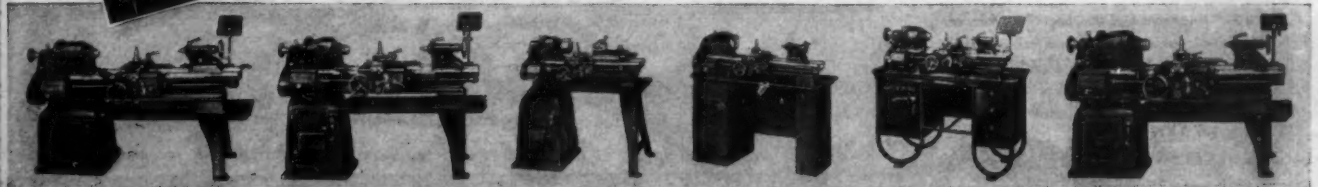
All standard South Bend Lathes, embodying the improvements developed in meeting exacting war production needs, will be available. No revolutionary models or design changes are to be expected. There will be no price increase — unless material or labor costs, or other conditions beyond our control, require it.

Here is a practical first step in putting your post-war plans into action. Send for Catalog No. 100-C and full information on this plan. Choose the lathes that meet your needs... place an order now, and be sure of earliest possible delivery.

South Bend Engine Lathes and Toolroom Lathes are made in five sizes: 9″, 10″, 13″, 14½″, and 16″ swings, with bed lengths from 3′ to 12′. The Turret Lathes are made with 9″ and 10″ swings. They are illustrated and described in Catalog No. 100-C.

SOUTH BEND LATHE WORKS

SOUTH BEND 22, INDIANA • LATHE BUILDERS FOR 37 YEARS



14½″ South Bend Lathe Bed Lengths: 5′ to 10′ | 13″ South Bend Lathe Bed Lengths: 4′ to 7′ | Series 1000 South Bend Turret Lathe, 10″ Swing | 9″ South Bend Lathe Bed Lengths: 3′ to 4½′ | 10″ South Bend Lathe Bed Lengths: 3′ to 4½′ | 16″ South Bend Lathe Bed Lengths: 6′ to 12′

They laughed when I asked for a left handed monkey wrench!

1 **"Listen,"** I said, "*I* know they don't make left-handed monkey wrenches or left-handed soldering irons! They didn't make *me* left-handed either. But the way you have this light fixed, I've got to either use my left hand or work in my own shadow!"

2 **"Hmmm!"** hmms the foreman. "Maybe you got something!" He calls the superintendent, and the first thing I knew the electrician had moved a couple of light fixtures. And what a difference! Next day they were checking up on the lights all over the place. I think I deserve a medal—or something!

3 **Simple changes** like this have speeded production and improved morale in many a war plant. Changes that eliminate *glare* or *shadows*—or *gloom* from dust and grease on lighting equipment, walls and ceilings. For lighting help, call your local electric service company, your G-E lamp supplier or your nearest G-E Lamp Office.

GENERAL ELECTRIC LAMP RESEARCH is responsible for much of the good lighting that is speeding war production today. The never-ending goal of that great research organization is to make General Electric lamps *stay brighter longer.*

"TO MAKE LAMPS STAY BRIGHTER LONGER"
The Creed of G-E RESEARCH

THE BEST INVESTMENT IN THE WORLD IS IN THIS COUNTRY'S FUTURE...BUY WAR BONDS

G-E MAZDA LAMPS

GENERAL ELECTRIC

Hear the General Electric radio programs: "The G-E All-Girl Orchestra," Sunday 10 p. m. EWT, NBC; "The World Today" news every weekday, 6:45 p. m. EWT, CBS.

Small Tool Shortage
EXTREMELY CRITICAL

MORE PRODUCTION* WITH LESS TOOLS**

Thru the Use of

McCASKEY TOOL CRIB CONTROL...

★LOST MINUTES TURNED INTO PRODUCTIVE HOURS

The line of two or three or more employees waiting at the crib window to draw and return tools represents a loss of production that is entirely unnecessary. McCaskey Control enables attendants—even the inexperienced ones in so many plants today—to locate tools without delay whether in the crib or out on the production floor, to record each transaction and to quickly serve everyone without a single dispute concerning responsibility for tools loaned or returned.

Numerous time studies made by users have shown that the average transaction with McCaskey takes only half the time with checks and other systems. (Examples on request.) The result is less idle time for men and machines—more production for both.

The works accountant of a large manufacturer of war products says: "A big reduction in the number of tool crib clerks required and an even larger saving in time of machine operators procuring tools has resulted. The McCaskey Control superseded the brass check method prevalent in former days."

★★"LOST" TOOLS LOCATED WITHOUT DELAY

McCaskey Control prevents employees from hoarding tools that should be in the crib available for use. Many "lost" tools simply are out-of-sight in some employee's tool box or at his machine. McCaskey fixes responsibility for each tool loaned to each employee, showing how many each has and how long each tool has been out. Tools are kept in circulation and inventories are reduced. Loss and theft are eliminated and breakage invariably is cut twenty-five to fifty percent.

Investigate these and numerous other savings made through McCaskey for a surprisingly low investment. Qualified industrial representatives are available to analyze your requirements and offer practical recommendations. No obligation. Write today.

From the Master Mechanic of a leading Rochester, N. Y., manufacturer: "In January, 1938, we replaced our old tool check system with McCaskey Tool Control. The loss of tools stopped immediately and so did all disputes about getting back the same tool loaned to employees. These and other savings have resulted in reduced tool costs."

Let us have a representative explain how McCaskey Tool Control can be installed in the busiest cribs without disturbing production in the least —or send you factual reports on McCaskey savings in time and tools in several well-known plants.

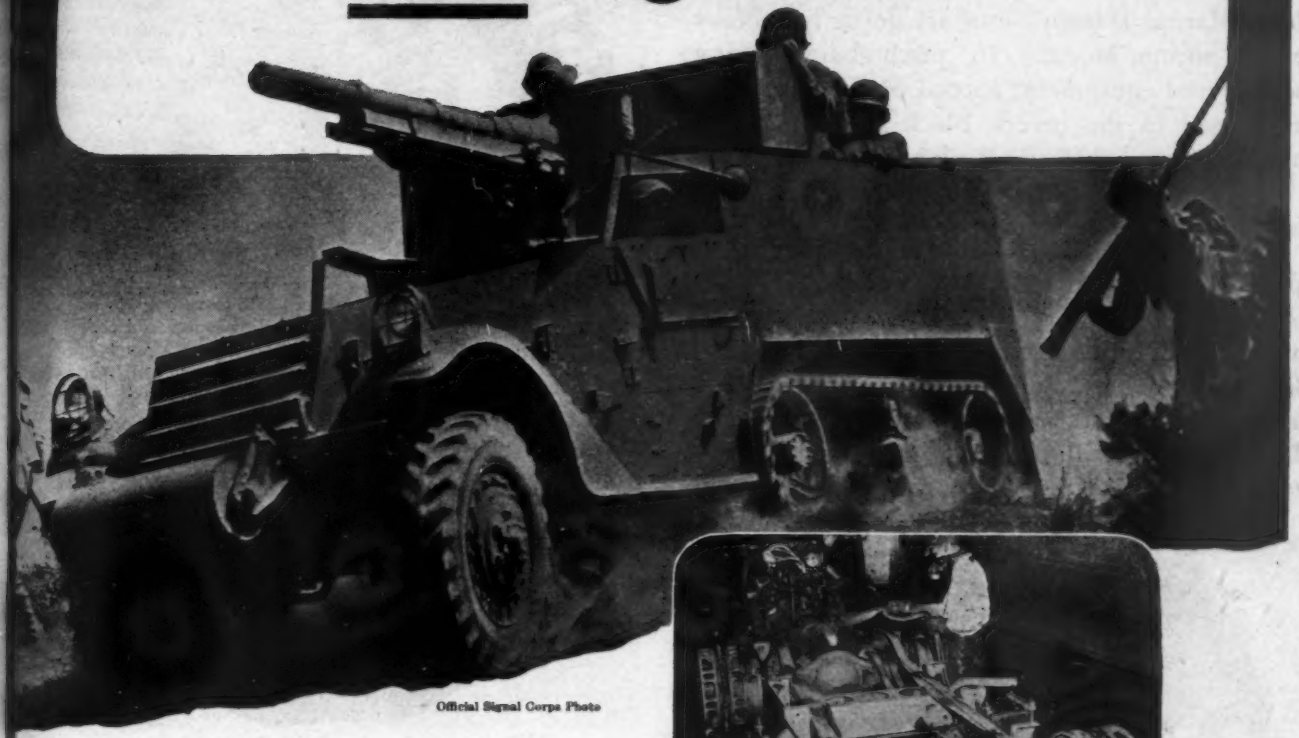
McCaskey Systems Ltd., Galt, Ontario, Canada — *The McCaskey Register Co., Watford, England*

THE McCASKEY REGISTER COMPANY, ALLIANCE, OHIO

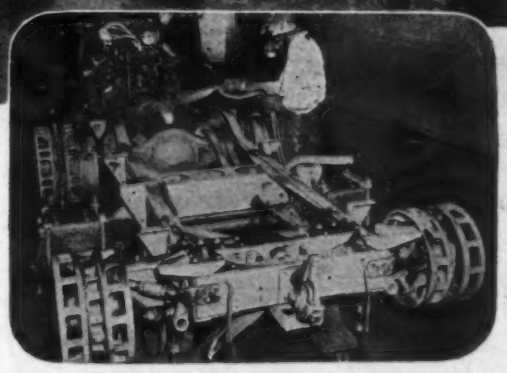
McCASKEY INDUSTRIAL CONTROLS

PRODUCTION • INVENTORY • MAINTENANCE • TOOLS • COSTS • PAYROLL

Half tank, half truck...
ALL fighter!



Official Signal Corps Photo



The story of a "halfbreed" weapon that stole the show...

Remember Salerno? One small group of U. S. lf-tracks had just been landed when a host of Nazi nks attacked. Outmaneuvering the foe with a hundred fferent tricks while their 75 mm. guns kept blasting way, those doughty half-tracks smashed or routed ery one of the enemy.

, time and again in this war, the show has been olen by America's "halfbreed" weapon—half tank, lf truck, but *all* fighter. Tops at smashing tanks or fantry on the ground or knocking planes from the , the speedy, versatile half-track ranks high in the teem of our fighting men.

ive us more of them, urges the Army. And to meet at request, Autocar, a leading half-track builder, is creasing production every month. In its finishing department Autocar employs a battery of DeVilbiss spray guns to apply protective paint over each unit in record-breaking time. The amazing speed of these DeVilbiss guns means that each Autocar half-track gets into the fight *sooner!*

Such time-saving, labor-saving devices, so important in war production, will be important in peacetime production, too. And now . . . or then . . . the correct DeVilbiss Spray System will put new speed into any finishing, painting or coating operation in your plant.

THE DEVILBISS COMPANY, TOLEDO 1, OHIO
Canadian Plant: Windsor, Ontario

DE VILBISS
Spray Systems

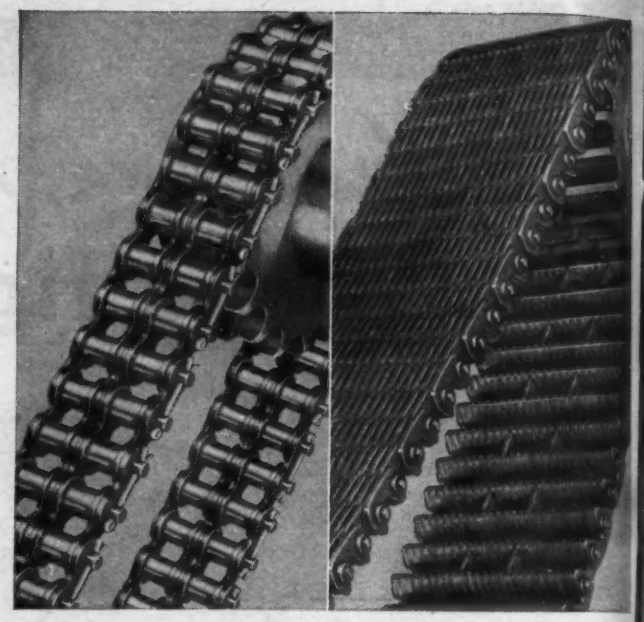
SPRAY EQUIPMENT • EXHAUST SYSTEMS • AIR COMPRESSORS • HOSE & CONNECTIONS

MORSE

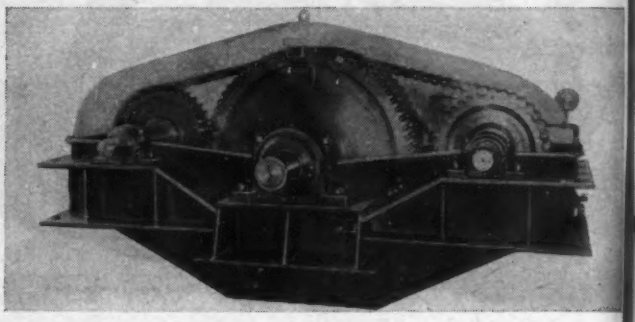
. . . WITH CLOSE TO HALF A CENTURY'S SPECIALIZED EXPERIENCE IN THE FIELD OF POWER TRANSMISSION MAKES VARIED EQUIPMENT TO FIT MANY NEEDS

Engaged in war work today, as are most manufacturers, Morse is supplying a wide variety of power transmission equipment to the armed forces. Morse Marine Transmissions are going into Navy vessels; minute Morse 3/16″ pitch chain is being used in vital equipment; special Morse chains are being used in the breech block mechanisms of anti-aircraft guns; Morse Roller and Silent Chain is being used in tanks and automotive vehicles, and on the machines producing ordnance equipment.

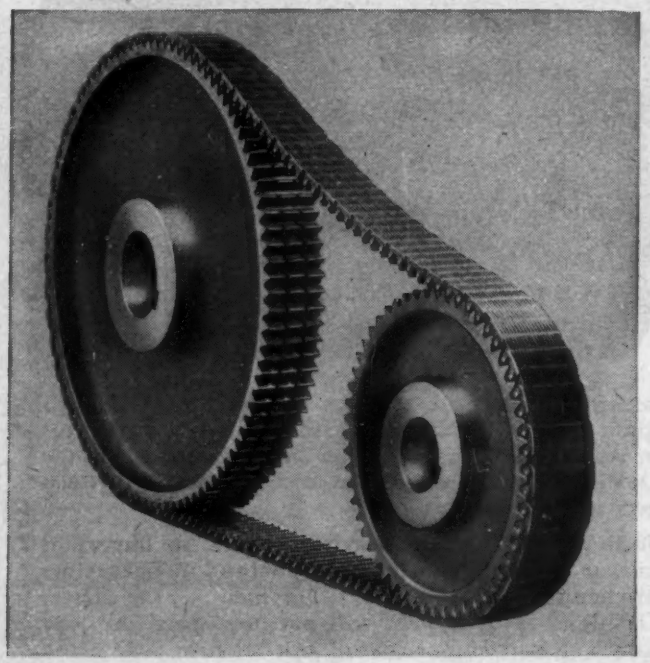
Specialists in their field, Morse offers a diversified line of power transmission equipment, enabling Morse to serve manufacturers more completely and better. Some of these products are shown here—most are available now, and all Morse products will, of course, be available when peace comes.



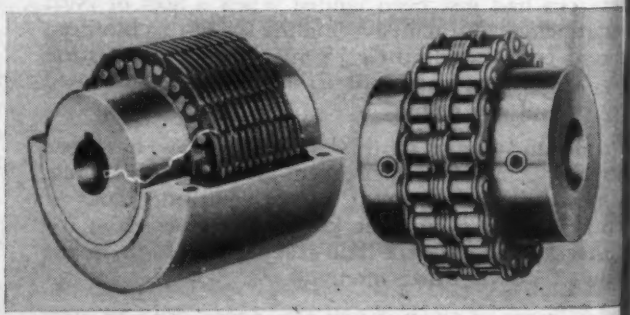
Morse Roller Chain and Morse Silent Chain is made in all standard sizes, and special Morse chains can be developed to meet specific needs. Morse Chain is widely used to transmit power loads of fractional HP to 5,000 HP, and for timing and conveying.



Morse Dual Drive and Marine Transmissions. Mounted in ships on barges or rail cars, they harness the power of two or more diesel or gasoline engines to a single shaft at most efficient speed ratios.



Morse High-Speed Drives, flexible, yet positive as gears, are doing a more efficient job of transmitting power at high speeds, today. Pioneered by Morse, they are slip-proof, they eliminate power waste, increase machine output, will find wide peacetime usage.



Morse Chain Couplings are used to couple shafts and compensate for slight shaft misalignments. Other Morse power transmission products include over-running clutches, sprockets, marine chain reducers, Morflex Couplings.

SPROCKETS CHAINS FLEXIBLE COUPLINGS CLUTCHES

MORSE Roller and Silent CHAINS

MORSE CHAIN COMPANY • ITHACA, N. Y. • DETROIT, MICH. • A BORG-WARNER INDUSTRY

Radiotone

Gives You All 3

RADIO

Radiotone assures the finest radio reception and reproduces the original program with true fidelity. Music in industry has proved its ability, to increase plant morale and production efficiency.

RECORDING

Radiotone records voice, orchestra or radio programs ready for instant reproduction. Permanently records management messages and directors meetings.

PUBLIC ADDRESS

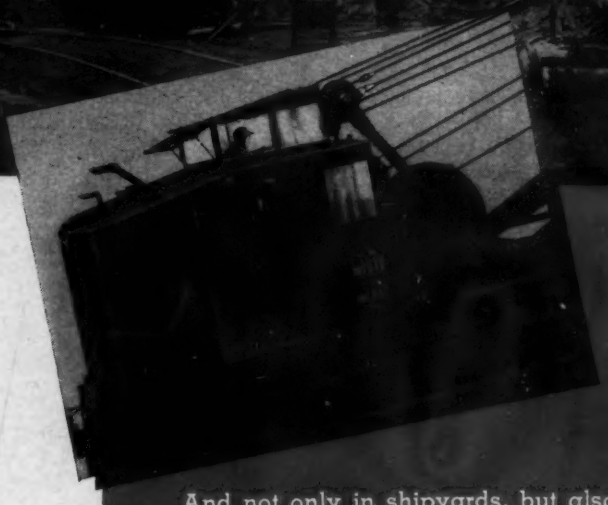
Radiotone can be equipped with any number of loud speakers or used in conjunction with your present P.A. system. Value of management announcements to workers without work interruption is well known.

Here is the ideal instrument for every plant using direct, recorded or radio broadcasting. Its quality and fidelity are equalled only by highest priced professional studio installations. Anyone can operate it. Anyone engaged in essential war work can buy Radiotone TODAY.

Radiotone

CRANE POWER MAKES SEA POWER

Below: An I. B. Crane at work in a large U. S. shipyard. Inset shows close-up of Monitor-type cab allowing operator 360° visibility.



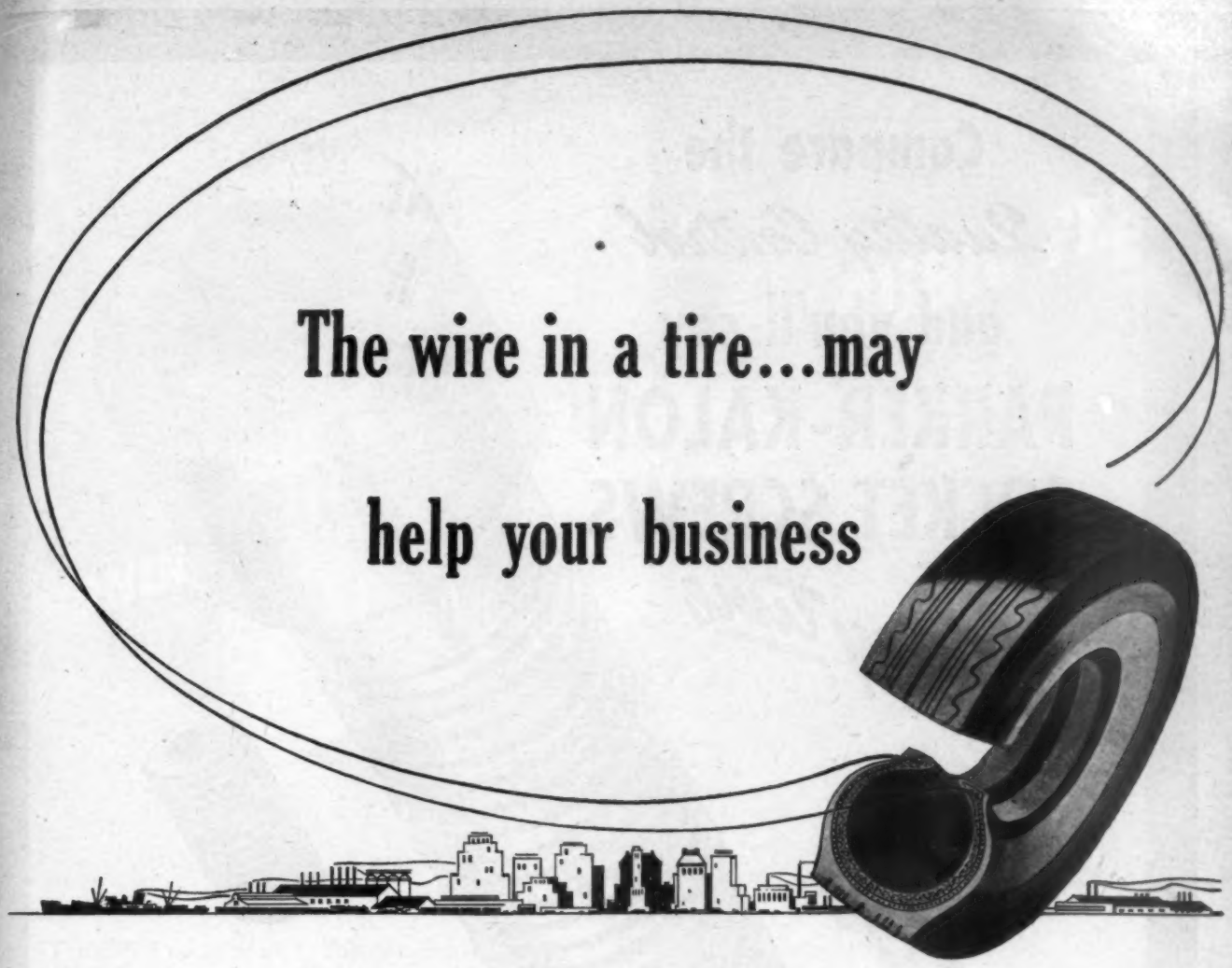
The great leap ahead that America has made in sea power since Pearl Harbor is in no small measure due to efficient material-handling equipment such as Industrial Brownhoist Cranes.

And not only in shipyards, but also in manufacturing plants, on railroads, on docks—wherever you find heavy material handling work—you will find Industrial Brownhoist Cranes. I. B. Cranes are working hard and fast up to 24 hours a day, seldom requiring time out for repairs.

Whether you handle heavy materials with magnet, hook, or bucket, I. B. Cranes can help you speed up your production for war or peace. For complete facts write to Industrial Brownhoist Corporation, Bay City, Michigan. District offices: New York, Philadelphia, Pittsburgh, Cleveland, Chicago.

INDUSTRIAL BROWNHOIST BUILDS BETTER CRANES

The wire in a tire...may help your business



PERHAPS you've never realized that wire is used in tires, but it is—as much as 16 pounds in some of the large truck tires. Without that wire, tires would not have the strength and rigidity in the bead—would stretch and come off the rim—and certainly could not take the one or more recap jobs which are helping to conserve rubber today.

Improving the quality and service of wire for tires, and developing time-saving, cost-reducing machinery for forming that wire into beads has been National-Standard's main job since the early days of the rubber industry. Working with rubber company engineers, we have helped them build better tires, at lower cost to you.

From this long experience, many new uses for wire in rubber have been worked out. Today, airplane de-icers, flat belts for conveyors, and V-belts for motor drives, tubular braiding for tubing and hose—all now perform better when reinforced with National-Standard wire.

Our engineering and research staff are looking ahead—to the many other ways in which wire can serve all industry. Why not take advantage of their experience and skill to help explore your problems?

★ ★ NATIONAL STANDARD Company ★ ★

Divisions of National-Standard Company

NATIONAL-STANDARD
Niles, Mich.
TIRE WIRE, FABRICATED BRAIDS AND TAPE

WAGNER LITHO MACHINERY
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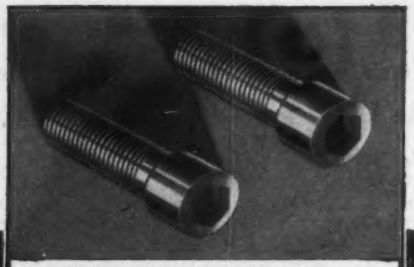
ATHENIA STEEL
Clifton, N. J.
FLAT, HIGH-CARBON STEEL

WORCESTER WIRE WORKS
Worcester, Mass.
ROUND STEEL WIRE, SMALL SIZES

Compare the *Quality-Control* . and you'll say PARKER-KALON SOCKET SCREWS *Every time*



THESE SCREWS LOOK EXACTLY ALIKE

Only Quality-Control can *foretell* the DIFFERENCE

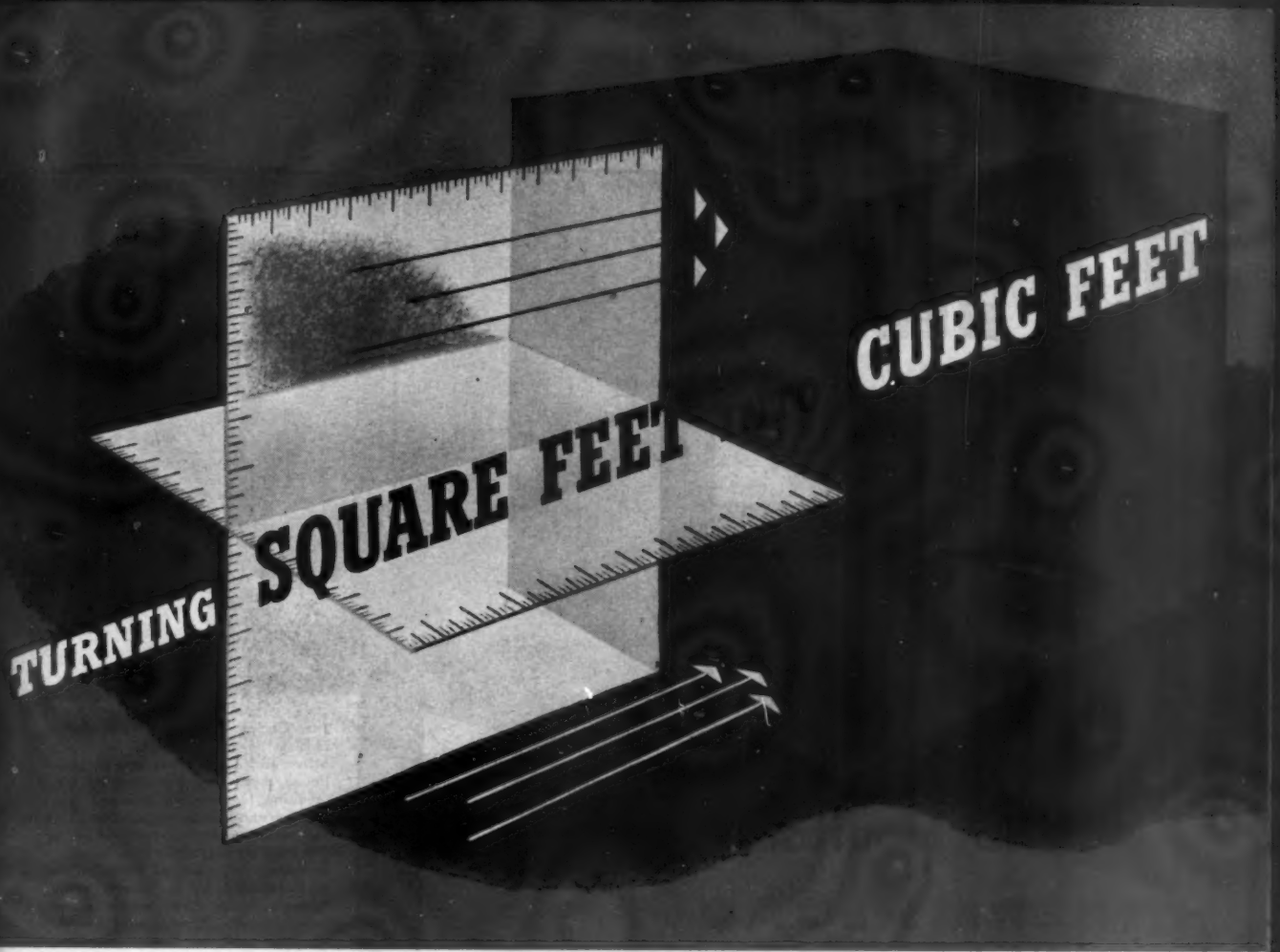
When tested in the P-K laboratory, one may be O.K., the other may fail. P-K Quality-Control makes sure you get *only* screws that are O.K.

This 16-Point *"Quality-Control"* check up --unequaled in the industry-- protects P-K Socket Screw users

The specially equipped P-K Laboratory checks on 1—Chemical Analysis. 2—Tensile Strength. 3—Ductility. 4—Torsional Strength. 5—Ability to take Shock Loads under Tension. 6—Resistance to Shock Loads under Shear. 7—Hardness. 8—Head Diameter. 9—Head Height. 10—Concentricity of Head to Body. 11—Socket Shape. 12—Socket Size. 13—Socket Depth. 14—Centricality of Socket. 15—Class 3 Fit Threads. 16—Clean Starting Threads.

You get unusual protection against "doubtful" screws when you specify "Parker-Kalon" . . . and it costs no more. Parker-Kalon Corporation, 196-200 Varick St., New York 14, N. Y.

PARKER-KALON *Quality-Controlled* SOCKET SCREWS



THERE'S no trick to it. You can convert usable square feet into profit-earning *cubic* feet by storing materials "ceiling high" with a Barrett Portable Elevator.

Stacking barrels, drums, cases and cartons in vacant air space is the simple, low-cost way to save valuable floor area . . . to multiply storage capacity by 200, 300, or even 400% without the expense of new construction . . . to cut handling costs from 25 to 65%. What's more, you conserve manpower because one man with a Barrett Portable Elevator can do the work of three or four! Thousands of plants have proved it!

Saving manpower is vital now. Saving money is important any time. A Barrett Engineer can show you how to save both.

BARRETT-CRAVENS COMPANY
3261 West 30th Street • Chicago, Illinois
Representatives in All Principal Cities

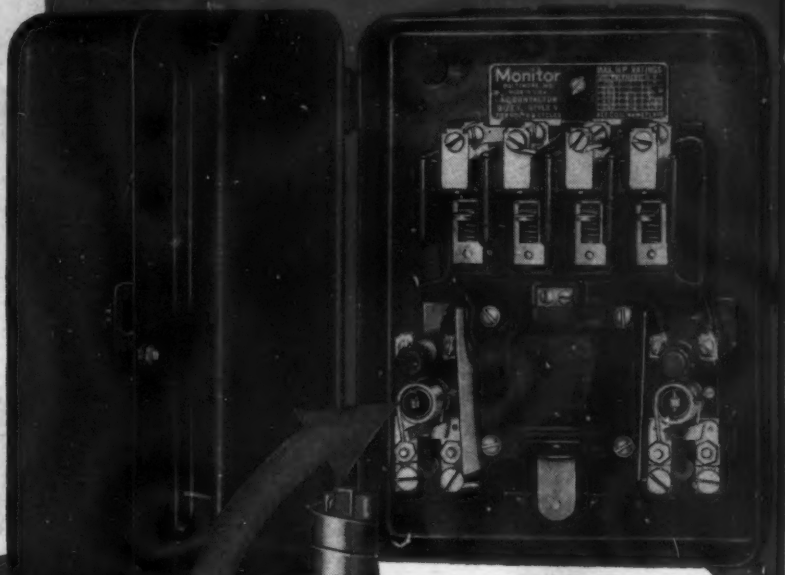
The Barrett Junior Catalog is yours for the asking.

BARRETT

ONE MAN DOES MORE THAN 3 OR 4 . . . WITH A BARRETT PORTABLE ELEVATOR

Barrett Handling Equipment

PRECISION MACHINES NEED *This* PRECISION CONTROL



The Monitor THERMALOAD V

SOLENOID TYPE MOTOR STARTER WITH *Compensated* OVERLOAD RELAY

★

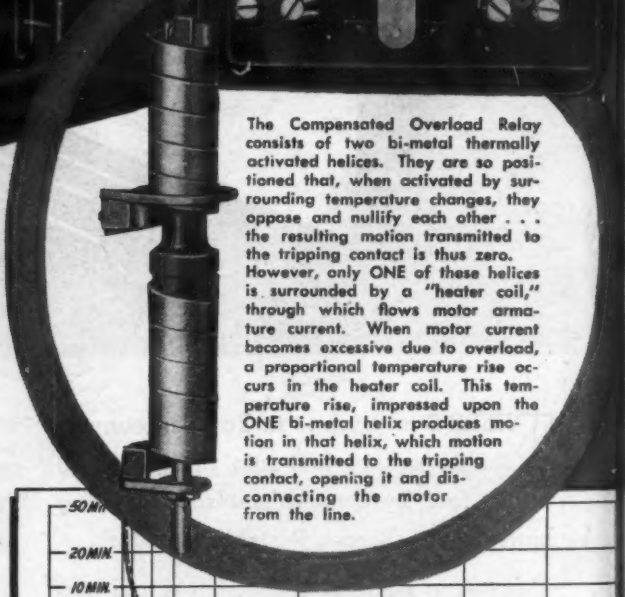
OVERLOAD ALONE CAUSES THE TRIP . . .

SURROUNDING TEMPERATURE MAKES NO DIFFERENCE!

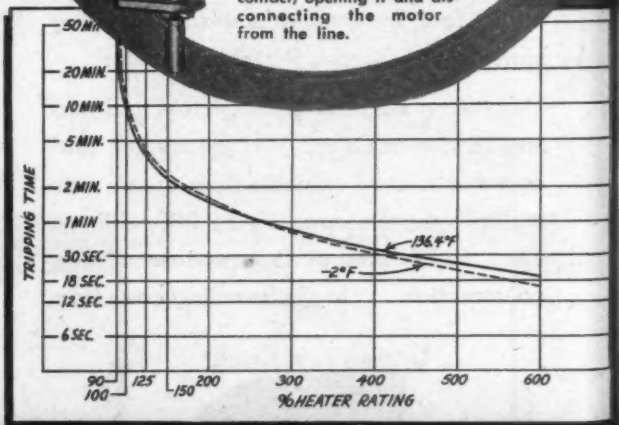
The motor that drives your production machine deserves the best possible protection you can give it. That's why you will find a steadily-increasing preference for the MONITOR THERMALOAD V . . . designers and electrical engineers are learning that they can prolong the life of their motors, reduce maintenance costs and avoid unjustified shutdowns by specifying the starter that is designed for today's . . . and tomorrow's . . . requirements.

The Monitor Thermaload V Motor Starter is available for motor ratings up to 7.5 H.P., 110-550 Volts A.C. Furnished also in combination units and with mounting suitable for front-of-board or back-of-board wiring.

Write for descriptive booklet that gives the complete story of the Monitor Thermaload V . . . tells ALL its features and the parts they play in PERFORMANCE.



The Compensated Overload Relay consists of two bi-metal thermally activated helices. They are so positioned that, when activated by surrounding temperature changes, they oppose and nullify each other . . . the resulting motion transmitted to the tripping contact is thus zero. However, only ONE of these helices is surrounded by a "heater coil," through which flows motor armature current. When motor current becomes excessive due to overload, a proportional temperature rise occurs in the heater coil. This temperature rise, impressed upon the ONE bi-metal helix produces motion in that helix, which motion is transmitted to the tripping contact, opening it and disconnecting the motor from the line.



Look at this performance graph . . . Note that at −2°F and at +136.4°F the tripping time varied only five seconds.

● CAN BE SHIPPED FROM STOCK

. . . in accordance with necessary priority regulations.

The Monitor Controller Company

GAY, LOMBARD & FREDERICK STS. BALTIMORE-2, MARYLAND

Monitor

You can handle jobs like these faster, more accurately—at lower cost with the

SUNNEN PRECISION HONING MACHINE

Hones and finishes internal cylindrical surfaces from .185" to 2.625" in diameter—with a guaranteed accuracy of .0001". Produces a super-smooth finish of 2 to 3 micro inches.

Does not require skilled labor—in many plants girls in 'teens are handling jobs in tenths.

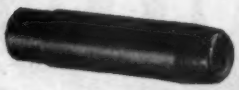
No jigs or fixtures needed—work is held in hands. Relieves big internal grinders for other jobs.

Low in cost, economical to operate. Fast—can be "set up" for any size in its range in less than a minute.

Let a Sunnen engineer check your job in your plant with this equipment—or write for bulletin giving complete information.

The coveted Army-Navy "E" waves over the Sunnen plant—evidence of the important part Sunnen equipment is playing in the war effort.

Carbureter Idler Valve Jet. Hole is honed after reaming for smooth action.

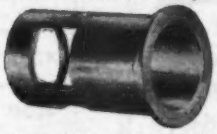


Cast Iron Valve Stem Guide. ½ to one thousandth removed—220 pieces per hour. Better finish and straighter hole.

Roller Bearing Outer Race. Finish improved from 12 micro inches to 2 micro inches.

Idle Control Valve Seat. Due to large "windows," almost impossible to get straight round hole by grinding. Sunnen solved the problem.

Bearing. A very small part. 2 micro inch finish necessary.

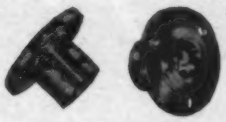


Hydraulic Valve. Previous method of grinding threw radius on edge of "windows." Sunnen honing eliminated trouble.

Aircraft Valve Tappet Roller. Honed after grinding to give 100% bearing surface.

Hydraulic Metering Valve Stem. Hole .156" in diameter; reamed, heat treated, and then honed. Honing 3 times as fast as previous method.

Wing Bracket. Two ¼" holes must be in line. Honing increased bearing surface and reamer life.



Stainless Steel Load Compensator Valve Seat. Hole is honed to .0002" limit.

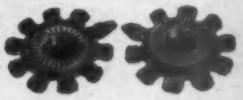
Aircraft Hydraulic Brake Cylinder. Honing three times faster than lapping—and gave a straighter hole.

Hydraulic Two-Way Control Valve. Hole is honed to eliminate leakage.

Aircraft Instrument Panel Control Wire Bushing. Hole .187" diameter—held to .0002", stock removal .001", sixty per hour.

Counterbore Cutter. Very small part and because of this fact hard to handle by any other method.

Pump Shaft Bushing. Bronze; honing follows reaming. Sunnen method greatly reduced valve leakage.



Calculator Machine Gears. Cut from hole which is reamed and then honed. Honing maintains same pitch line concentricity.

Aircraft Valve Guide. Valve tappet roller pin hole honed to 6 micro inch finish.

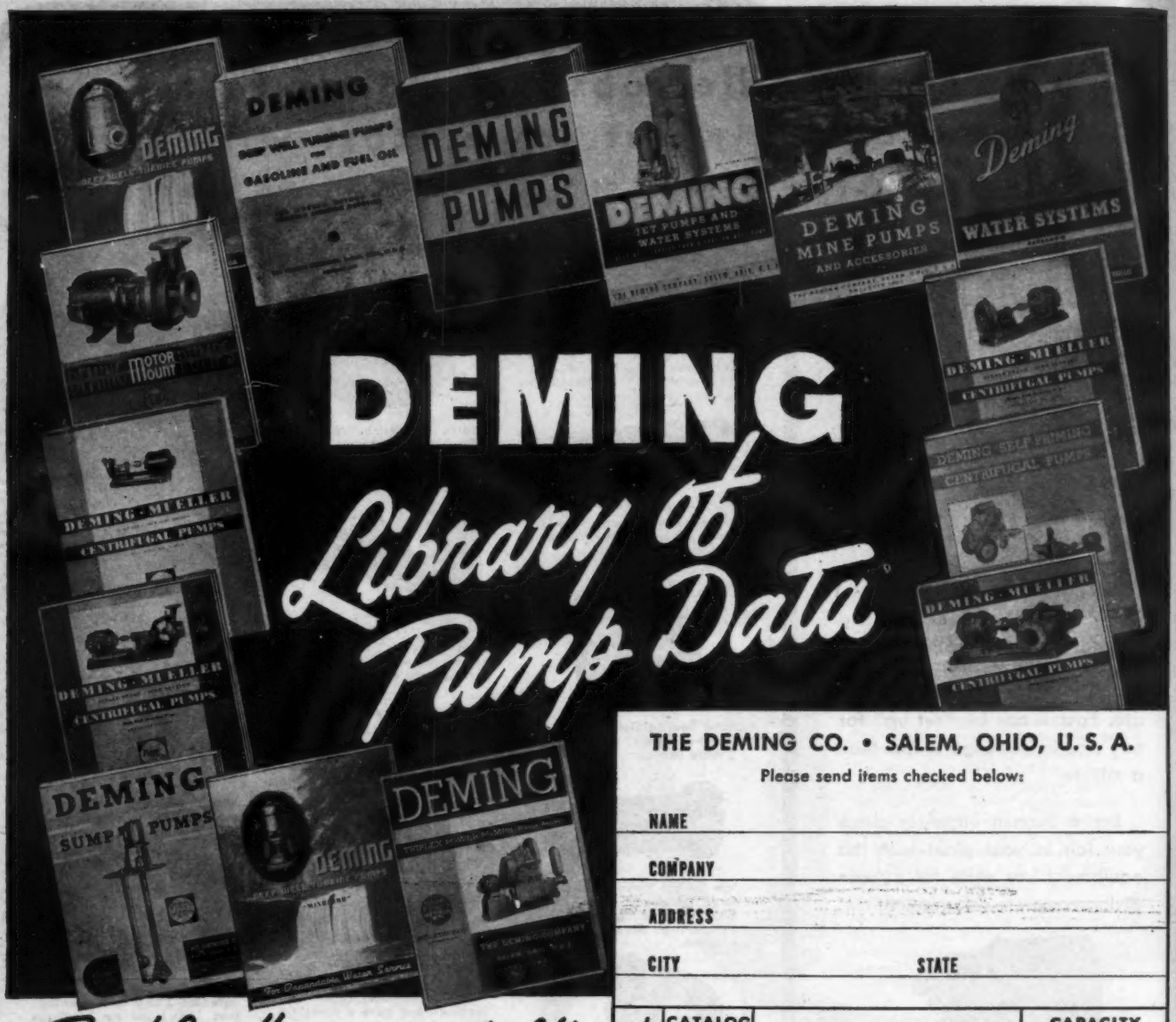
Header Die. Life of header dies increased 3 to 9 times over lapping. Knock out pin breakage practically eliminated.

Carbureter Metering Jet. Two black bushings Bakelite. Line honing by Sunnen method.

Spur Gear. By honing gears direct from heat treatment, concentricity of pitch line is maintained.

SUNNEN PRODUCTS COMPANY, 7938 Manchester Avenue, St. Louis, Mo.

Canadian Factory, Chatham, Ontario



DEMING *Library of Pump Data*

Send for all or any part of it

Note the form at the right. It lists 15 different catalogs and bulletins prepared to help you locate the most suitable Deming pump or water system for specified requirements. A wide diversification of types, sizes, and capacities are covered by this "Deming Library of Pump Data."

Check the item or items in which you are interested; fill in your name and address; and mail the form to us. Your request will receive prompt attention. No cost to you, of course.

THE DEMING COMPANY · SALEM, O.

DEMING *Pumps*

THE DEMING CO. • SALEM, OHIO, U. S. A.

Please send items checked below:

NAME

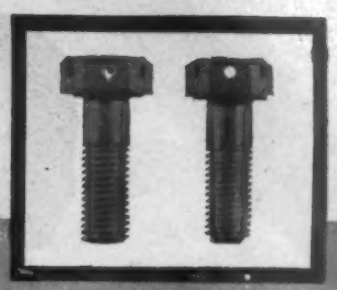
COMPANY

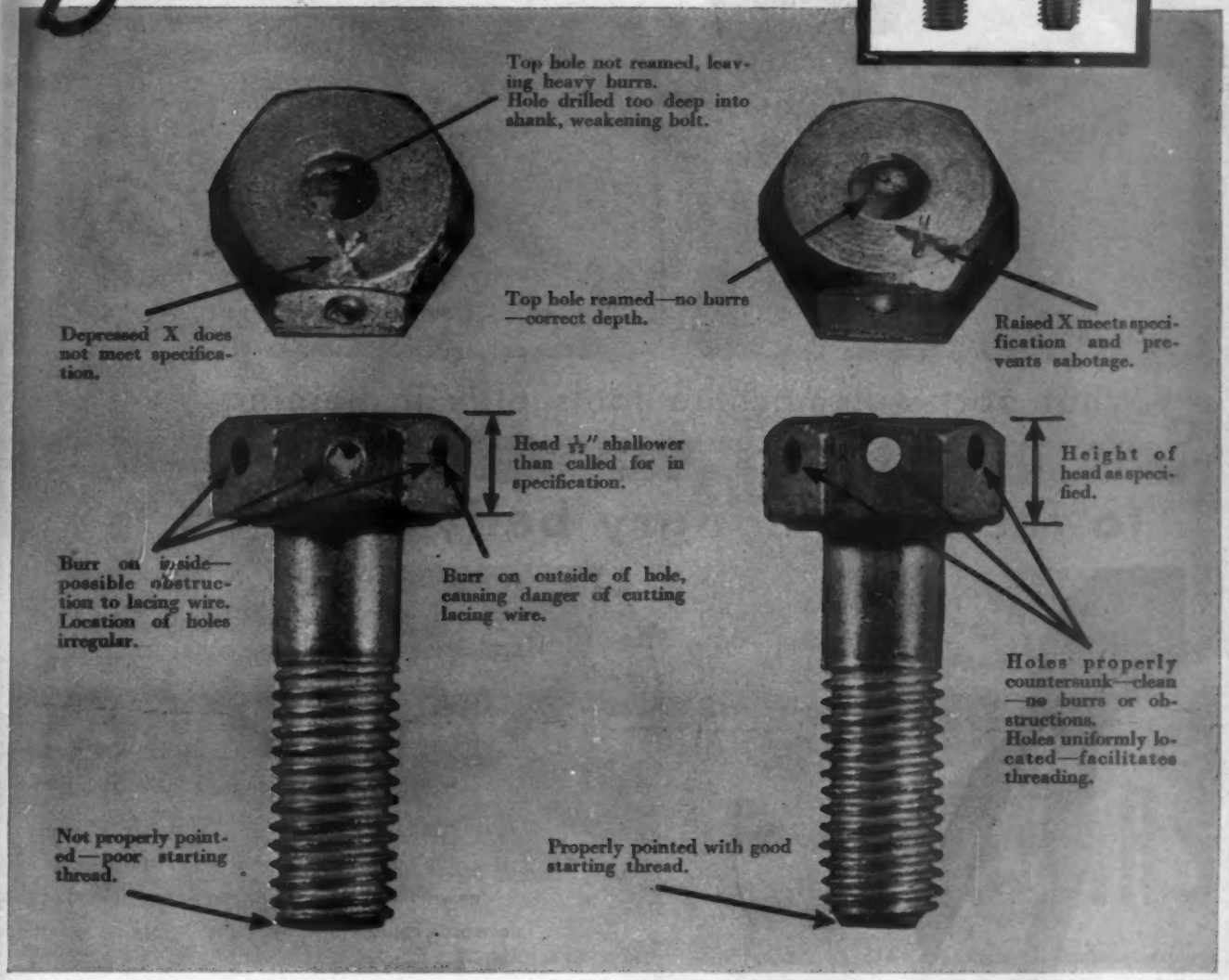
ADDRESS

CITY STATE

✓	CATALOG NUMBER	TYPE OF PUMP	CAPACITY RANGE
	4700-B	Deep Well Turbines	15 to 3000 G.P.M.
	4701	Minuturb Deep Well Turbines	15 to 80 G. P. M.
	4200	Single-Stage, Side Suction, Two Ball Bearing Centrifugal Pumps	10 to 3600 G.P.M.
	4006	Single-Stage, Side Suction, Single Ball Bearing Centrifugal Pumps	10 to 3600 G.P.M.
	4301	Motor Mount Centrifugal Pumps	5 to 650 G.P.M.
	5003	Single-Stage, Split Case Centrifugal Pumps	Up to 5000 G.P.M.
	3900-A	½, ¾, 1 and 1½ inch Side Suction Single Ball Bearing Centrifugal Pumps	2 to 80 G. P. M.
	3000	Self-Priming Centrifugal Pumps (Portable and Stationary types)	10 to 300 G.P.M.
	1000	Mine Dewatering Pumps	Wide Range
	4603	Sump Pumps. Vertical types	10 to 3200 G.P.M.
	4700-G	Turbine-type Gasoline and Fuel Oil Pumps	15 to 1000 G.P.M.
	300-B	Triplex Power Pumps—Single Acting	Wide range
	Catalog "E"	Water Systems—All Types	All capacities
	J-4900-B	Jet Pumps and Water Systems	200 to 4500 G.P.H.
	Catalog "33"	Complete catalog. General line	All capacities

BOLTS are different!




Top hole not reamed, leaving heavy burrs.
Hole drilled too deep into shank, weakening bolt.
Depressed X does not meet specification.
Top hole reamed—no burrs—correct depth.
Raised X meets specification and prevents sabotage.
Head 1/32" shallower than called for in specification.
Height of head as specified.
Burr on inside—possible obstruction to lacing wire. Location of holes irregular.
Burr on outside of hole, causing danger of cutting lacing wire.
Holes properly countersunk—clean—no burrs or obstructions.
Holes uniformly located—facilitates threading.
Not properly pointed—poor starting thread.
Properly pointed with good starting thread.

HERE ARE SOME OF THE IMPORTANT DIFFERENCES TO LOOK FOR

An aircraft company in California wired us to have our representative come and look at some of the bolts they were getting—presumably from us. We looked at them, but they weren't our bolts, as the customer soon confirmed.

Unretouched photographs, greatly enlarged, only partially indicate the differences that are apparent on close inspection of the bolts themselves—one taken from the batch that caused the complaint, and one from *our* regular production.

Any engineer, production man or aircraft inspector knows that these differences are important.

National
HEADED AND THREADED
PRODUCTS

THE NATIONAL SCREW & MFG. CO., CLEVELAND 4, O.

What part will machine tools play in helping to feed this hungry belly?

Here stands a souvenir of War—a silent, implacable challenge to the meaning of our words . . . Here stands *want*.

A grim reminder that we must not waste food now—that we dare not complain—it also says, as no words could, that part of the victory we're fighting for can only be won with plowshares.

What part will machine tools play? The greatest part in history. For there is scarcely an essential to civilized living today that does not stem from a handful of basic precision machine tools . . . from the barest necessity, a loaf of bread, to the most intricate and wonderful machines which help men think, to search and to know.

And one of these machine tools—the internal grinding machine—is essential to the creation of literally *everything* that will make this world a better place in which to live, after this war is won.

BRYANT

BRYANT CHUCKING GRINDER COMPANY SPRINGFIELD VERMONT, U.S.A.

back of them ...

The shadow of GEARS

THERE is no substitute for "soup" any airman will tell you—"soup," the concentrated energy that giant Pratt & Whitney engines develop to speed the mighty Hellcat on its missions of destruction.

And back of these planes—back of the giant 2,000 horsepower engines that power them are gears. Gears of such extreme precision—held to such close tolerances—that each one is a modern marvel of engineering and manufacturing perfection.

Foote Bros. take pride in the production techniques that make such high precision possible—pride in the manufacturing "know-hows" that are responsible for the tremendous quantities of these gears rolling off production lines in three of its huge plants.

And Foote Bros. are looking ahead to the day when these precision gears will mean a new approach in the economical transmission of power in peacetime machines. Already on the drafting boards of many manufacturing plants are machine tools and construction equipment—combustion engines and other machinery that promise new efficiencies because of the precision gears they will employ.

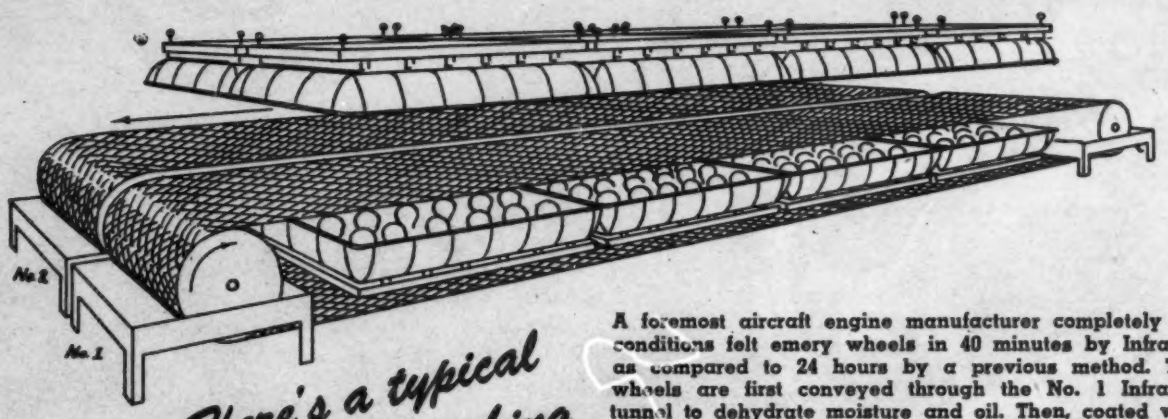
FOOTE BROS. GEAR AND MACHINE CORPORATION
5225 S. Western Blvd. • Chicago 9, Illinois

FOOTE BROS.

Better Power Transmission Through Better Gears

If YOU HAVE A BAKING-DRYING DEHYDRATING-PREHEATING Problem

INFRARED WILL PROBABLY SOLVE IT



Here's a typical result of switching to Infrared—

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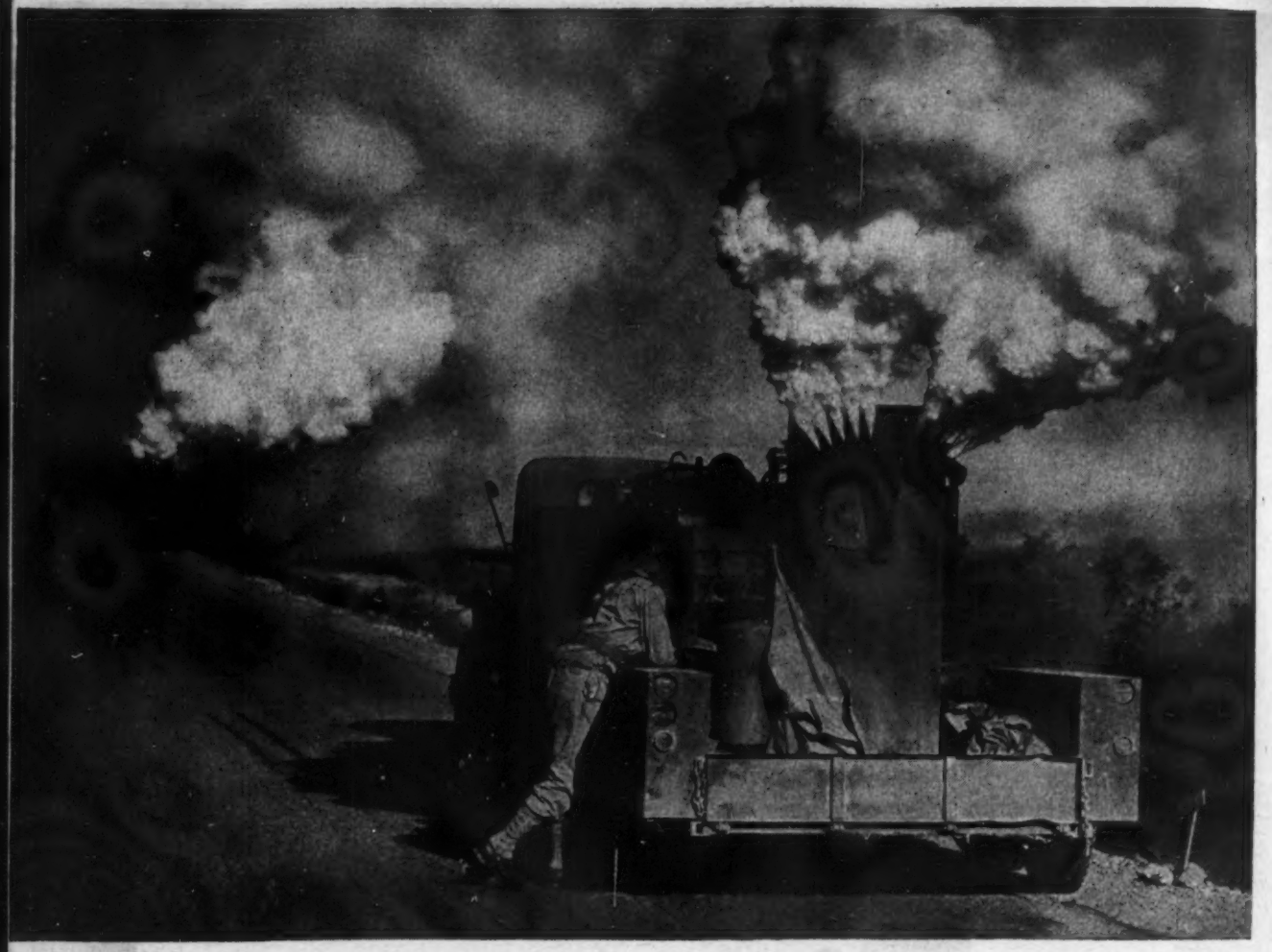

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TUNE IN FRED ALLEN EVERY SUNDAY NIGHT—CBS ★ HELP WIN THE WAR BY RETURNING EMPTY DRUMS PROMPTLY

Reconversion *and* Contract Termination

AMERICAN industry is dedicated to an all-out effort to achieve victory, and its good faith in this direction is amply demonstrated by the results.

American industry also is dedicated to making democracy work effectively after the victory. And it is toward this objective that industry must prepare itself to guide the processes of demobilization and reconversion in order to minimize the dislocations and chaos which too easily can result from so tremendous a task.

We exercised foresight from the very beginning of the war mobilization program. Let us now exercise foresight in the approaching changeover from a wartime to a peacetime economy.

The first step in converting American industry from military to civilian production is the termination of contracts between the government procurement agencies and the producers. There are now in force war contracts amounting to tens upon tens of billions of dollars. As the demand for weapons of war decreases, the Armed Services will undertake to cancel contracts. With the emphasis shifting from weapons of one category to weapons of another category, many billion dollars worth of contracts already have been terminated. It is hoped that the experience now being gained in this work will provide the basis for effective and sound procedures when an avalanche of cancellations comes later.

Many complex problems involved in the termination of contracts will materially influence the success of the entire reconversion program. Once war demands fall off sufficiently to permit the renewal of civilian production, we will have to act with great speed if we are to avoid large-scale unemployment. Prompt financial settlements of contracts and the rapid clearance of plants are of immediate and great significance. In many cases the removal of equipment and raw materials will be more important than money payments. The allocation of raw material for civilian production will be of paramount importance.

Government agencies obviously must exercise great care in spending the people's money and in protecting the interest of the public against excessive payments. Unjust enrichment at the expense of the people will not be condoned nor will it reflect favorably upon management to present inflated claims. But long-delayed negotiations, which will retard the initiation of civilian production, likewise must be avoided.

The contracting agencies and the manufacturers both know that the greatest losses in the reconversion period will result from delays in getting peacetime production under way. The

greatest potential wastes lie in unemployment and in idle plants. The magnitude of such losses to the public can be far greater than the money spent in liberal settlements; to the manufacturer, these losses can represent vastly more than the extra funds that might result from interminable litigation. Policies must be firmly established **now** whereby the manufacturers, including subcontractors and suppliers, will receive substantial settlements immediately in order that ample funds be available for reconverting plants and accumulating necessary inventories of peacetime goods. Nor must we overlook the fact that the uncertainty of long drawn-out disputes will have a stifling effect on enterprise and that final settlements, therefore, should be made as promptly as possible.

Plants that are equipped largely with special wartime tools and machines and that are fully stocked with materials, components, and finished military products will not be able to undertake any substantial degree of conversion until this machinery and this inventory are removed. Advance arrangements are essential for the prompt clearance of great numbers of plants the country over. Adequate warehousing facilities must readily be available so that the changeover to civilian production will not be hampered.

As war demands decline, civilian output will be resumed; and while we recognize that the demands for munitions must vary as the strategy of the military leaders is changed, it is hoped that the Armed Services already have or soon will develop schedules of their continued needs under different strategic assumptions. If we know in advance the probable curtailment in war requirements we are in position to estimate the timing and the quantities of raw materials, the number of workers, and the industrial facilities which will be available for peacetime purposes. It will then be possible to integrate the lifting of restrictions on civilian production with the drop in war production.

Needless unemployment and idle plants will prevail if restrictions on the output of civilian goods are removed at a slower rate than available manpower, materials and plants permit. On the other hand, if the controls on civilian production are removed prematurely or too freely, then the production of military requirements will be hampered correspondingly. There will be great clamor and pressure for eliminating all restrictions as soon as any measurable quantity of materials and numbers of workers are freed from war work. It will react adversely on industry as well as on government if these pressures are heeded indiscriminately, thereby retarding the production of munitions for our boys who still will be fighting and dying at the front. The coordination of declining war demands with increasing civilian production probably is the most difficult and at the same time the most important task in our entire reconversion problem. Advance planning and sound judgment are essential.

An order of priority for initiating non-war or civilian production must be prepared beforehand. The schedule of resumption of peacetime production should be governed by the amounts of

materials, manpower and facilities that are available as well as by the relative needs or importance of different products. There will be strcng competition for priority among the various kinds of consumer goods, equipment needed for reconversion, producers goods required for expansion and modernization, and export demands. Relative need obviously is the most compelling criterion. But because of the importance of expediting reconversion, earliest consideration is urged for the tools and fixtures and models which will expedite large-scale civilian production when adequate labor and materials are available. In any case, advance schedules will be needed to avoid a makeshift, piecemeal lifting of controls on the basis of who shouts the loudest.

Another difficult problem of the reconversion period will be to keep to a minimum the distortion of inter-industrial and intra-industrial relationships. Many varieties of consumers goods compete for the consumer dollar, and some industries will offer strong resistance if the green light is given first to industries whose products may thereby acquire a time advantage.

Even more difficult will be the matter of competition between companies producing the same products. Some manufacturers may find themselves tied up with continuing war contracts with restrictions on their peacetime products suddenly lifted and their competitors free to take advantage of the situation. The declining need for different kinds of war materiel will vary greatly, and some producers inevitably will be available for peacetime production considerably in advance of some of their competitors.

This raises the question of victory models or nucleus plants to eliminate competitive advantages among producers of identical products pending the time when all are on an equal footing again. Policies controlling this should take into account the degree or the extent of competitive advantage which reconversion might bring, and also upon the time interval during which these advantages will prevail. Such programs necessarily mean increased government control, hence they should be adopted only under the most pressing circumstances.

There is the important question of termination as between large and small plants. Fairness must be exercised, and undue advantage to either group must be avoided in extending opportunities to continue receiving profitable war orders or in getting back into civilian production. The problems of small manufacturers must not be neglected in this period. Likewise, any restraints on new ventures and on more vigorous competition must meticulously be avoided.

There also is the question of communities which have been greatly enlarged and others which actually have been brought into being by the war. It might be advisable to terminate contracts in these areas first in order that the workers might be encouraged to migrate elsewhere while employment prospects are most favorable. Also, if continued production of some armaments is contemplated after the war, it might be well to concentrate this production in communities which otherwise would be stranded.

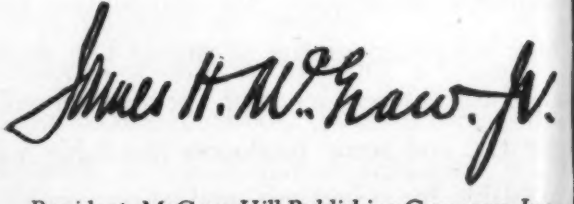
If the process of terminating contracts is to be geared into meeting continued demands for munitions and also expediting reconversion, then the Armed Services must accept broad policy considerations as criteria for cancelling contracts. Procurement officers might be inclined to cancel contracts with all high cost producers first. Or they might be inclined to cancel small producers first so as to reduce the administrative burden. Then again, they might cancel the newer producers of specific products rather than the older, time-tried manufacturers.

These procurement criteria may all be highly desirable and efficient but other important considerations such as those mentioned above must be given proper attention. ***Demobilization cannot be a separate process from reconversion.*** They must be united. The termination of contracts is a demobilization task, but I am confident that the procurement agencies appreciate the importance of this operation in facilitating reconversion and that they will take full cognizance of the policies necessary for giving every assistance to initiating peacetime production.

I have not attempted to raise all the important policy questions in terminating contracts, nor do I propose specific solutions for each major problem. Rather it has been my purpose to indicate the complexities of the task which faces us and to urge that intelligent and sound plans be developed now while there is time. By so doing, we can avoid the dislocations and economic disorder which otherwise might characterize the reconversion period. The better we are prepared, the more rapid will be the resumption of full employment and good business after the war is won.

This job of changing America's industrial pattern from war to peace speedily and efficiently, is one which will tax the talents and knowledge of the ablest business men of the country. These men can, and I am sure that they will, attack this task with the same energy and determination that characterized their efforts in the period of mobilization for war.

Industry advisory committees were established to cooperate with governmental agencies in the great task of conversion to a full war economy. These committees are the means through which industry has the opportunity to play a major role in the solution of the problems of reconversion. It must assume that responsibility or accept the consequences in the form of enforced government control. Industry must take a renewed interest in these committees and make certain that our best minds and strongest men are available for the challenging job of conversion which we face now. It is a job that must be done well if we are to have a good start on the road to a greater democratic and free enterprise nation.



President, McGraw-Hill Publishing Company, Inc.

FACTORY
MANAGEMENT AND MAINTENANCE

L · C · MORROW · EDITOR

Industry's 1944 Job

Industry's 1944 job will be to get out war production and civilian production at the same time. The plateau of war production has been reached. The pipelines for the most part are filled. Production still must go up on certain war items, but the over-all 1944 requirements are estimated to go along at about the December, 1943, level. Serious materials shortages for war products are a thing of the past. Some materials are being stockpiled. Some manufacturing capacity is becoming available because of cutbacks, cancellations, and non-renewals of orders.

Partial reconversion from war production to the manufacture of civilian products therefore becomes a necessity in many factories. For some plants, even some industries, the reconversion job is not difficult physically; for others it means complete change. In both cases the objective is to do the job with minimum reduction in employment and minimum increase in the prices of civilian products.

To achieve this objective, quick-acting contract termination arrangements will have to be made by the government. Once the war job in a given plant is done, the manufacturer is going to have to be able to move equipment, finished product, parts in process, and raw materials *at once*. And he is going to have to get most of the money due him just as quickly. Industry has a big stake in contract termination and must work ceaselessly with the government and with the services to secure effective arrangements.

Another requirement for reconversion will be the exercise, in civilian manufacture, of just enough control to effectuate a fair deal. As cutbacks and cancellations are made, which plants are to get the materials and the manpower to go back to civilian production? Are these arrangements to be left to chance, or to government choice, or are the members of an industry to have the say-so by agreement? Some agency—government, or industry, or combination of the two—will have to be in authority. Industry must attempt to get these things settled promptly.

Manpower in general and men in particular are going to constitute an influential variable in attaining the 1944 objective. What of placement and rehabilitation of discharged veterans? What of seniority? What of women? What of dismissals? The answers to these questions will have to be worked out during 1944, and a great deal of management-labor cooperation is going to be necessary in the process.

There is also the never-ending need for ever-increasing output per unit of input of human energy, materials, and power. More than ever the post-war job, beginning now, is going to require industry to attain low production costs, in the interest of low selling prices, to induce wide distribution and consequent high standard of living with plenty of employment.

Industry's job in 1944, therefore, is the same job industry has had in past years, but with new emphasis—both on detail and on management's responsibility as a whole.

L C Morrow

Jobs After the War

A Series of Articles on Post-War Employment Problems

In the American economy, full employment in the durable goods industries is essential to widespread over-all employment. A large part of durable goods consists of capital goods, of which we have a large surplus and extraordinary capacity to build more. The philosophy is advanced here that the national job-welfare will be served if we exchange capital goods for the raw materials of other countries. The materials selected would be those we have dissipated because of the war. They would be stockpiled, and the stockpiles would be "sterilized," to be released in emergency only.

4. SHALL WE TRADE CAPITAL GOODS FOR RAW MATERIALS?

CANNOT THE UNITED STATES exchange capital goods, of which it has too many, for stockpiles of the raw materials which we have recently expended in such unprecedented amounts, and of which other nations have plenty?

Nation A has bauxite, nation B has oil. Another nation has manganese, while others have timber, tin, chromium, furs. All of them need, want, and intend to get capital goods—machine tools, turbines, mining machinery, transportation equipment—with which to raise the living standards of their people. And we are the world's foremost producer of such goods.

Some of the highest officials in Washington are discussing this proposal of exchanging capital goods for raw materials. For obvious reasons their identity cannot be made public. But the theme of their discussions is as stated here, and their reasoning runs something like this:

1. The continuance of our high living standards will depend on full employment in America.

2. Total employment in this country is unobtainable by means of agriculture and the consumer goods industries alone.

3. The true key to full employment is activity in the industries making durable goods (capital goods).

Starting from that point, self-interest dictates that we look around for a market for our capital goods. There are two dangers in permitting these goods to accumulate in surplus quantities. First, a surplus will choke off further production and thus curtail employment. Second, this, in turn, will retard our technological progress.

Markets exist where needs exist. So our search for buyers of our capital goods inevitably forces us to lift our eyes and look beyond our accustomed horizons—toward Latin-America, Russia, China, and devastated Europe.

The peoples of the world, the Russians outstandingly, have become keenly production-conscious as a consequence of this war. American industry, as a matter of fact, has been their teacher. Our overwhelming production performance has driven home to them the industrial lessons of decades in a few short years. They will build and rebuild industrially—whether we sell them the tools or whether some other nation does so.

It has been said that Russia alone has made plans for the purchase of 30,000 locomotives, 150,000 miles of railroad tracks, and 50,000 electric light and power stations. Preliminary estimates of an unofficial character suggest that this one customer can place orders for as much as $5,000,000,000 worth of goods on the basis of expenditures already planned. The Russians are anxious to get the war over so they may return to their program of industrial expansion.

What these men in Washington are talking about, of course, is foreign trade. Yet they are not talking about foreign trade in the abstract. They are not proposing that we be "world-minded" in some visionary way. They know that industry views most appeals for more "international" spirit with well-grounded misgivings. "Hands across the sea" are all very well but not if one of the outstretched hands is empty. Good neighbors are desirable, of course, but, also, good neighbors don't forget to return the lawnmower. Industry is accustomed to thinking of business matters in business terms, not in terms of philosophy or diplomacy. Industry has a right to ask whether or not we propose to give away the products of our manu-

facture for idealistic reasons alone. When industry raises this question, it is thinking properly in the national interest.

Actually, these men whose ideas we are presenting here are thinking in terms of "American jobs." They want to see our durable goods industries busy because they know it is necessary for these particular industries to be busy if there are to be enough jobs to go around.

Basically there are just three ways of accomplishing any human transaction. You give, you lend, or you sell. Giving is folly, lending is dangerous, and selling is sheer, simple common sense. Need we give away our shirts in order to get this vast business abroad? Need we gamble our future prosperity on ill-secured monetary credits? Giving our shirts and providing extensive credits could turn out to be the same thing. We might enjoy a brief illusion of prosperity if we were to pay our customers to pay us. But that isn't good business and it shouldn't be necessary.

Our Wealth Depleted

Now a nation's strength, like that of an individual, is subject to constant expenditure and cannot normally be replenished. Our wealth and strength are still great, yet they have been depleted enormously by the war. Why, then, should we not consider with open minds any plan which might restore the war's depletions? Perhaps by doing so we might enable posterity to say of us that we had thus found a sort of national fountain of youth, rebuilding our strength for the use of the coming generations.

Certainly we might some day be grateful for a plentiful standby stock of petroleum, to cite one example. There are nations who would now be glad to send us crude petroleum in return for our capital goods. Where could we store any large stock? It has been suggested and is being seriously considered that huge quantities might be placed in the empty oil fields of Pennsylvania. Perhaps this is a fanciful idea, perhaps it is not, but it raises a thought-provoking question of its own. Why are those oil fields empty now? Because we exhausted them while believing them inexhaustible. Then we had to seek further in the oil fields of the west. Thus ultimately we discovered that our oil resources were not inexhaustible. And the war then taught us that they have positive, visible limits.

The one big thing the war has taught, in fact, is the well-nigh fantastic scope of the demand which an emergency can make on a nation's resources of whatever sort. There was a period, during the critical days of this war, when we should have been glad to have stockpiles, the bigger the better, of anything you could name—including things which we had supposed to be available in embarrassingly excessive amounts.

There is another lesson which we may learn in the period following the war. That is the huge extent of the demands which the human needs of peacetime can make on the world's resources if living standards are constantly improved and the techniques of manufacture are spread widely over the globe. This, incidentally, is another factor which should improve our view of the value we can place on the materials we acquire in return for our manufactured goods.

Some industrialists worry about competition that would be created between the United States and other nations if those nations became industrialized. This fear is groundless so far as early effects are concerned. The industrial production of Russia and other countries cannot become so great as to be seriously competitive with us for a great many years. Like the United States, these countries have to raise their own standards of living, *or else*. To do so they will have to keep all the products their industries make. Russia, in particular, has been able to secure devotion and cooperation from her people because they have been led to believe in the *future*. Work *now* for high standards of living later, they have been told. That was the plea when they were asked to work for little or no pay to bring the first 5-year plan to fruition—then the second 5-year plan—and now the present World War.

China, India, and some South American countries would take in exchange for raw materials our less productive and used equipment, because these countries have plenty of labor to offset low machine productivity.

So, perhaps, we should at least consider the thought that any stockpiles we build today, including even those which seem to duplicate overabundances, may someday be reckoned among the nation's most priceless assets.

The word "stockpile" probably raises a danger signal of apprehension—perfectly sincere apprehension—in many minds. Many who would support the principles of large-scale stocking of materials may yet honestly fear its application in human hands. They point out that big stockpiles in government possession *might* be "dumped" at any time with ruinous effect on the private owners of materials. This danger should not be overlooked, of course. A way would have to be found of "sterilizing" such stockpiles, so that irresponsible use of them would be literally impossible. Moreover, the "dumping" of such stockpiles, if it were attempted, would probably cause a protest so severe that no congress and no president would authorize it save in time of actual national emergency.

Further, those who fear the stockpiling idea should remember that if capital goods production falls to the low levels of 1932, the demand for materials will fall likewise and the private owners of surpluses will be forced to carry the inventories themselves, perhaps at disastrous price levels. If, on the other hand, government stockpiles, no matter what their size, are properly isolated and frozen—walled off from the rest of the economy—then the demand for new materials generated by new manufactures will be felt immediately and directly in the mines, mills, forests, and smelters. At stake in the world of the future are a prosperous peace and lasting national security. We have the cards. If we play them properly, these officials say, we can win.

Job for the Experts

The intricacies involved in working out this exchange of United States capital goods for raw materials from abroad are obviously a job for the best of our experts in statecraft and finance. Even the officials now discussing the plan have made no effort to propose a detailed program. But they point out that when industry and government agree on a policy the obstacles to its achievement usually can be overcome.

At any rate, say the Washington men who provided the substance for this article, "Only by some such means can we stop surplus capital goods from glutting the market and preventing employment in the durable goods industries. When we have extensive unemployment in the durable goods industries, we have serious deficiencies in employment as a whole."

The Earlier Articles in the Series

1. Reemployment of Veterans (July).
2. Contract Termination (October).
3. Backlogs and Savings (December).

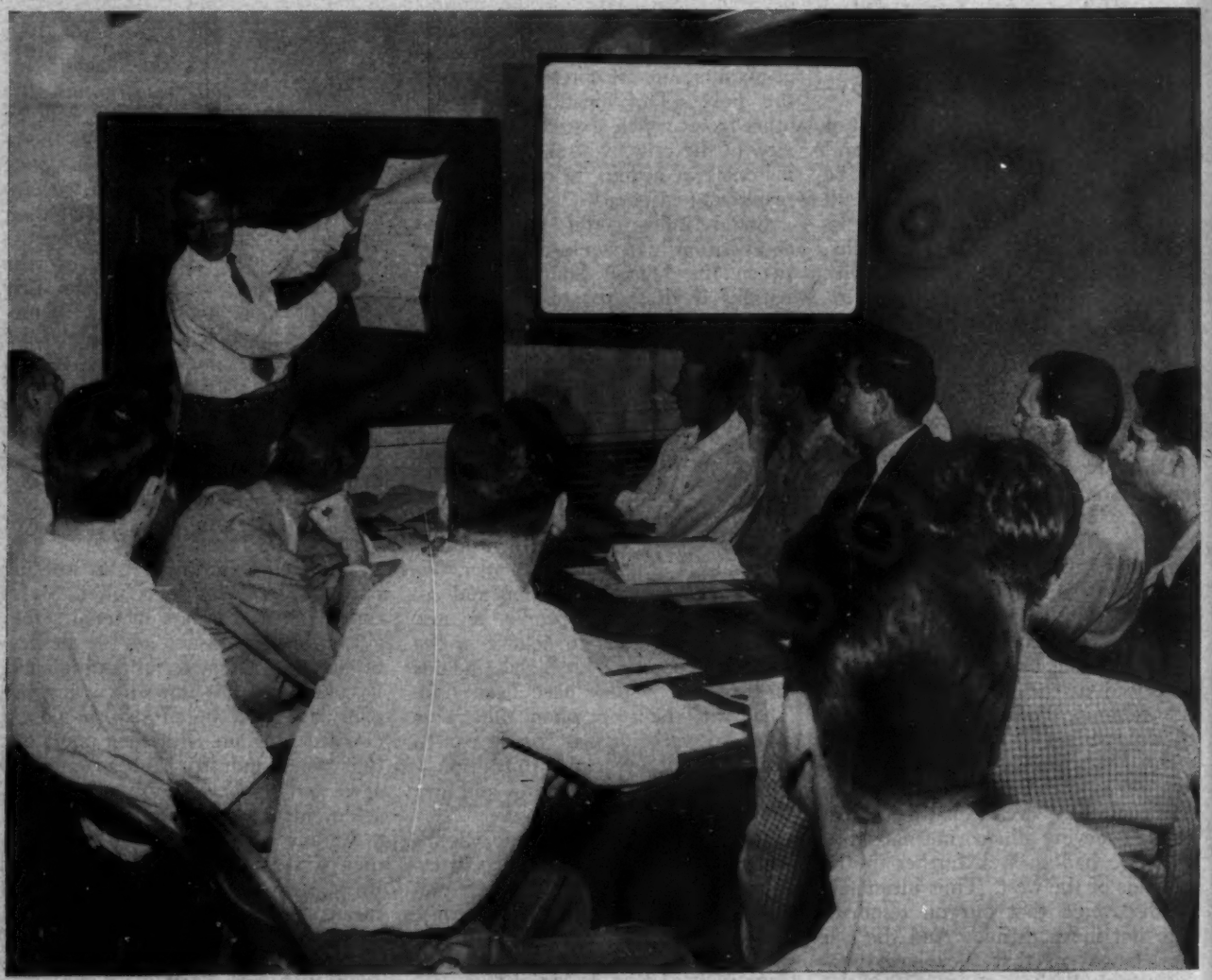
Workers' Ideas That Save 4,000,000 Man-Hours

BY USING THEIR HEADS as well as their hands, employees of Lockheed Aircraft Corporation, Burbank, Calif., have figured out production short-cuts that will save some 4,000,000 man-hours annually. These suggestions brought $270,000 in cash awards to the workers who thought up the time-saving, labor-conserving ideas.

This efficient utilization of men and machines was achieved through classroom courses in work simplification for supervision and an improvement suggestion plan inaugurated in October, 1942. The suggestion plan encourages people to think and contribute ideas aimed at improving their own efficiency and that of the departments in which they work. Not only does the employee receive 10 percent of the first year's savings, up to a maximum of $500, if his suggestion is accepted and put into operation, but he is also given an uplift in morale through the knowledge that he has contributed something tangible, over and above the work for which he was hired, toward the winning of the war.

Augmenting the employee suggestion plan is a supervisory training course consisting of ten 1-hour lectures by work simplification experts. More than 6000 line supervisors, department heads, and company executives completed this accelerated course within a recent 4-month period, the result being closer cooperation and teamwork between supervisory personnel and the production worker with ideas in the back of his head.

In the pages that follow, FACTORY presents a few examples that show how this double-barreled attack is helping Lockheed make best possible utilization of men and machines.



Work simplification class for supervisory personnel at Lockheed listens to Allan H. Mogensen, industrial consultant and consulting editor of *Factory*, preach the gospel of "the one best way." Some 6000 men in supervisory or executive positions have been graduated from the accelerated course he has set up

BEFORE

AFTER

1. PRUSSIAN BLUE speeds up the checking that is needed to determine whether the retractable landing gear has been properly installed. *Above, left,* Thelma Rogers demonstrates how she had to peek through a hole (after removing a plate) to see whether the gear had retracted far enough to touch the rubber bumper high up in the nacelle. When a new oil line was added to the nacelle between the openings and the bumper, it became almost impossible to see well enough to check this operation. In the new method (*above, right*) she daubs a bit of Prussian blue onto the bumper. If the gear retracts as it should, a smear is found on the strut when the gear is lowered. Thelma got $180 for suggesting the better way.

2. SUPERVISION trained in work simplification can often speed up work right on the spot. Paul Sykes, manager of processing and heat treating, notices (*below, left*) that an operator is loading channel corner strip assembly parts the hard way. Parts are stacked on one side. She moves one at a time. She is too meticulous about piling parts in a series of neat rows, whereas speed is far more important than precision piling in this simple job of getting parts ready for anodizing. He shows her (*below, right*) how, by stacking parts on both sides of the workplace, she can use both hands. And he points out that perfect order is unnecessary.

BEFORE

AFTER

CONTINUED ON NEXT PAGE

BEFORE

AFTER

3. CLEANSING TISSUE was the basis of Velma Hydron's typically feminine proposal. *Above, left,* she demonstrates old method of applying decals to B-17 control panel. The decal was soaked in water, applied with roller or blotter. This often left air bubbles under the decal, which then had to be scraped off. That ruined the paint job, so the panel had to be disassembled and sent back to the paint department. In the new method (*above, right*) cleansing tissue replaces roller or blotter. It absorbs water faster, and all air bubbles are removed by pressure of the wrist. This does away with need for re-work, saves time and expense.

4. OMISSION of an entire operation brought J. T. Maloney, a gang leader, the maximum award. He asked "why?" and won $500 by suggesting that a fiber shim be eliminated from the assembly of a Ventura PV-1 gas tank area. It was formerly necessary to insert shim, mark holes with a grease pencil, punch them out, replace shim, line up holes, and hold shim in place with screws while riveting. Maloney's suggestion was approved. Result: a saving of 1½ man-hours per ship.

5. **MAXIMUM AWARD** went to housewife Ruth Berger who suggested a new break-down wiring system for B-17 wings. Formerly it took several shifts to turn out a single assembly; now two assemblies can be completed for each wing on each shift. The idea involves use of two wiring boards instead of one, to allow more people to work on the job at one time without interfering with one another—and a change in sequence of operations. It used to be impossible for more than two people to do the first hour's work without stepping on each other's toes. Now five girls work on the board right from the start. Mrs. Berger is the only woman at Lockheed to win a $500 award.

6. **CHANGE IN SEQUENCE** of operations and the adding of four pick-up stations save 76 man-hours in B-17 lower gun turret support assembly. Two employees, John R. Schwartz, and Gilbert Miller, split the maximum award for the idea. They suggested that work which formerly required 8 hours per operation in each jig be stationed out into several pick-up jigs, with not more than two men working on a jig at one time. Formerly up to six men had been working on the big jig and falling all over one another in the process. Now 19 men can build 4 assemblies in 8 hours, thereby cutting man-hours from a minimum of 114 per assembly to today's maximum of 38 hours.

7. **ELIMINATION** of decals on turnbarrels and safeties in Ventura PV-1 engine installation was the improvement suggested by Agatha Tollefson; she wearied of putting on 38 decals indicating inspection of engine installation units, because later she saw the same decals crack and fall off, or become so badly blurred they could not be read. By eliminating the decals, one of which she is shown applying in the accompanying photograph, she has saved 3½ man-hours per ship. The inspector is now responsible for the entire rigging as a whole instead of wire by wire. This idea paid $462. Now an inspector at Lockheed Plant A, formerly Vega, Miss Tollefson used to be a glue room operator for a fiberboard company.

CONTINUED ON NEXT PAGE

8. **THREE-TIME WINNER** is Dorothy Platz, who has turned in three improvement suggestions. She demonstrates (*above*) an idea for which she was paid $65. Half a man-hour per bomber is saved by her suggestion to inflate tires for final inspection in the fuselage section. Under the old system the wheel was installed in the fuselage section, but the inspector's decal merely meant that the installation was okay, not that the tire had been properly inflated. It was then necessary in final assembly to break the decal, remove metal cover, inflate tire, again apply inspector's decal, and replace cover. The new way eliminates one inspection.

9. **LESS WORK** for the janitor, was the idea behind a work simplification suggestion made by Rosella Travis, a drill press operator, who is shown (*left*) sweeping shavings into a cloth bag tacked to the end of her work-bench. A good housewife, Rosella has learned that it pays to keep as much work off the floor as possible. Her idea brought her a check—and the thanks of the grateful janitors.

BEFORE

AFTER

10. **FLUSHING** the hydraulic system of a B-17 has become a simplified operation because of a suggestion made by Catherine Matheson and Maurice Fortier, who split a check for $500. Old way (*above, left*) was to pour the oil into the reservoir in the upper cockpit and let it drain down into the hydraulic system to remove air. Sometimes the deboosters would airlock and have to be rejected, removed, or displaced. In the new method (*above, right*) oil is introduced at the brake drums. The air is pushed up through the deboosters and the metering valves to the reservoir, where it escapes from the system. Three gallons of oil and 10 man-hours per ship are thus saved. For more complete realization of what a suggestion like this one may mean, multiply the above figures by the total number of ships now rolling off the Lockheed production lines.

11. **FASTER** and easier on the thumbnail is the new method of using masking tape—the result of Ann R. Nagler's suggestion, for which she got $370. Masking tape must be wrapped around parts of tubing to keep paint off the portions that go under the clamps that fasten the tubing to the airplane. Paint would cause friction, with resulting interference with radio reception. In the old method (*below, left*) the tape was pressed flat against the tubing, painted, then removed with the thumbnail. The new way (*below, right*) is the same except that the tape is turned under a quarter-inch. It may now be removed instantly—and with no wear and tear on the nails.

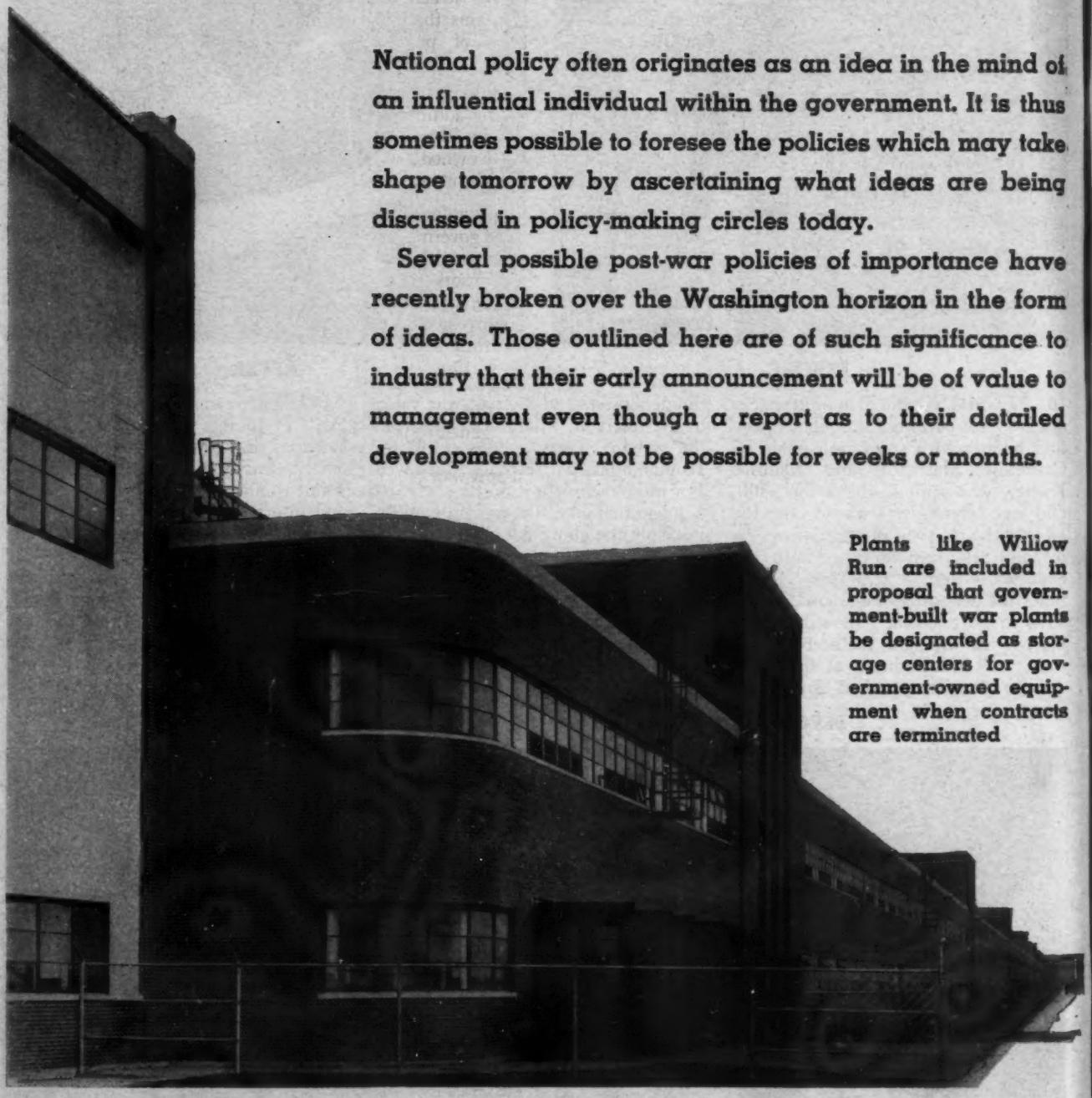
BEFORE

AFTER

A Plan for Warehousing at Contract Termination

National policy often originates as an idea in the mind of an influential individual within the government. It is thus sometimes possible to foresee the policies which may take shape tomorrow by ascertaining what ideas are being discussed in policy-making circles today.

Several possible post-war policies of importance have recently broken over the Washington horizon in the form of ideas. Those outlined here are of such significance to industry that their early announcement will be of value to management even though a report as to their detailed development may not be possible for weeks or months.



Plants like Willow Run are included in proposal that government-built war plants be designated as storage centers for government-owned equipment when contracts are terminated

THE USE of government-built special-purpose war plants as warehouses for the storage of government-owned equipment and materials from private war plants may soon be proposed officially as an answer to a potential post-war problem of the utmost gravity.

This proposal, still highly tentative, means roughly that certain structures (e.g., big ammunition and ordnance plants, bomber plants of the Willow Run type, and emergency shipyards) would be designated as storage centers. For example, one network of warehouses might be set apart for the centralized storage of raw copper stock, another for machine tools, and still another for sheet aluminum. Thus physically classified and lodged on government land, these properties could be held economically for years and fed slowly into the market on a systematic basis. This would avert the ruinous price effect of sudden "dumping" and at the same time assure better prices than the government usually gets when it tries to sell something.

Not half enough thought has been given, some government officials believe, to the whole question of the quick disposition of the vast quantities of U. S. property which fill the yards and plants of contractors today. One outstanding official is particularly concerned and will do his utmost to help this "stepchild" find a place of prominence among post-war problems. He believes, indeed, that it should be given priority because of its immediate importance to any large-scale reconversion that may result from cutbacks within the next few months.

Obstacle to Reconversion

Conceivably, he says, the question could raise the most formidable of obstacles to prompt reconversion even if all the others (such as contract termination, materials, manpower, and even markets) were solved. In many an instance, a company with, say, $100 millions in war orders might put in its termination claims, get prompt payment, and then say to the government: "Now what do you want us to do with $30 millions of machine tools, $25 millions of raw materials, and $15 millions of goods-in-process?"

To this, as things stand, the procurement agencies can give no clear answer. Presumably, the goods-in-process would be scrapped (or finished and scrapped as in some cases after the first World War), but the tools and raw materials would have to be stored and a good part of them would have to be housed. On all these questions the procurement agencies have no clear policy, far less an over-all program for mass stockpiling and systematic disposition of goods.

It is hard to tell what might happen, for example, to Company A (an actual case). A recent survey showed that there was not spare room on the plant's premises for 2 percent of the government's machinery and equipment. If that company's war orders were substantially cut back, the management would be stymied completely on reconversion even if it had the money, the materials, and the manpower for peace goods production. The obvious solution—storage of its government-owned goods in private warehouses at government expense—has proved, on examination, to be no solution at all. There isn't storage space in the entire surrounding city for a tenth of the volume.

From industry's point of view, therefore, the warehousing question is distinctly one of "jobs after the war." Companies caught in this particular dilemma might suffer loss of markets (while more fortunate competitors prospered), and their employees would suffer with them.

From the taxpayer's point of view, the use of government-built plants for storage space promises two principal economies:

1. The government can store property more cheaply by using structures which it owns and maintains than it can by paying the fees of private owners of storage facilities.

2. The government would be spared the expense of constructing additional storage structures (since in all probability the existing privately owned storage facilities are far from adequate).

There will be shudders aplenty in the new plan for storage of government goods, too, and no one knows this better than the plan's sponsors. The public will shudder at the notion of destroying all those shiny goods-in-process, obsolete though they may be. Congressmen, particularly those with private warehouse owners in their districts, will shudder. Also the Army and Navy will shudder on general principles. And the prospective purchasers of the war plants at post-war prices may shudder likewise.

But the plan's sponsors (hard-headed businessmen who, as individuals, might have a use for a war-baby plant or two themselves if the price were right) are determined to stick to their guns, so convinced are they that the program is overwhelmingly in the public interest.

Danger of Dumping

They point out that nothing could react more ruinously to industry as a whole—and to post-war reemployment as a result—than the indiscriminate dumping of government industrial equipment and materials. In this they see the danger of especially great damage to capital goods activity and a possibly disastrous general reduction of prices in all fields.

Moreover, they contend, the manufacturing industries do not need much of that vast additional new plant for production purposes. Management, they contend, might far better concentrate on building up the productivity of its own greatly expanded plant and make what capital investment may be needed in the improvement of its own facilities. The post-war race, they believe, will be not necessarily to the swift but to the efficient—and the low-cost producer will prevail.

Finally, they see no fair way of choosing one company as purchaser for the government-built plant without doing an injustice to its competitor. What they want and will fight for is a uniform, over-all plan, worked out to a gnat's whisker right now so that, whenever "V-day" comes, each manufacturer will be told telegraphically and immediately: "Grease and pack our tools and ship them to warehouse Number 77, Destination X ——; send copper bar stock and brass to warehouse Number 148, Destination Y"; etc. They may get their way at that.

Advance Payment

The prospect of mandatory advance payment in contract termination cases (see "Jobs After the War," No. 2, FACTORY, Oct., 1943) has brightened materially in recent weeks. The public quarrel between the War Department and the controller-general (both of whom oppose advance payment) over jurisdiction of the termination job didn't do either one of them any good and gave WPB a bigger voice in the decision. Advocates of mandatory payment had previously dared to speak only of a 75 percent advance, now talk boldly of 90. The Murray (Senate Small Business) Committee may come around completely to this view before long with a far better prospect of getting Congress to accept it than was visible two months ago.

Another idea (new and as yet but little discussed) may crop up as a big one before long. That's the idea of permitting manufacturers to make new capital improvements for post-war reconversion purposes on a 5-year tax amortization basis, just as they made investment originally for conversion to war work. The idea hasn't gotten far and its own sponsors haven't worked it out in detail. But it may gain strength.

At the very least, it should be classed among the "sleepers," such as the proposal for government-backed "dismissal bonuses" to war workers in strictly temporary jobs (e.g., transient employees of shipyards and airframe plants in areas such as Mobile, Ala., where there never was any prospect of their finding employment in other local industries). Payment of, say, $300 to family men, it is suggested, might enable them to migrate to other areas and get set in jobs voluntarily—much preferable to shifting them around or sustaining them indefinitely under government supervision.

In FACTORY's opinion the ideas set forth here, based on interviews with first-flight officials who were willing to "think out loud" for FACTORY's benefit but not for quotation, will bear watching because of the force of their sponsorship and because of their apparent merit, regardless of any administrative changes that may take place.

Mechanization Means More Packing, Less Manpower

D. W. SAXTON, Superintendent, Hoover Ball & Bearing Company, Ann Arbor, Mich.

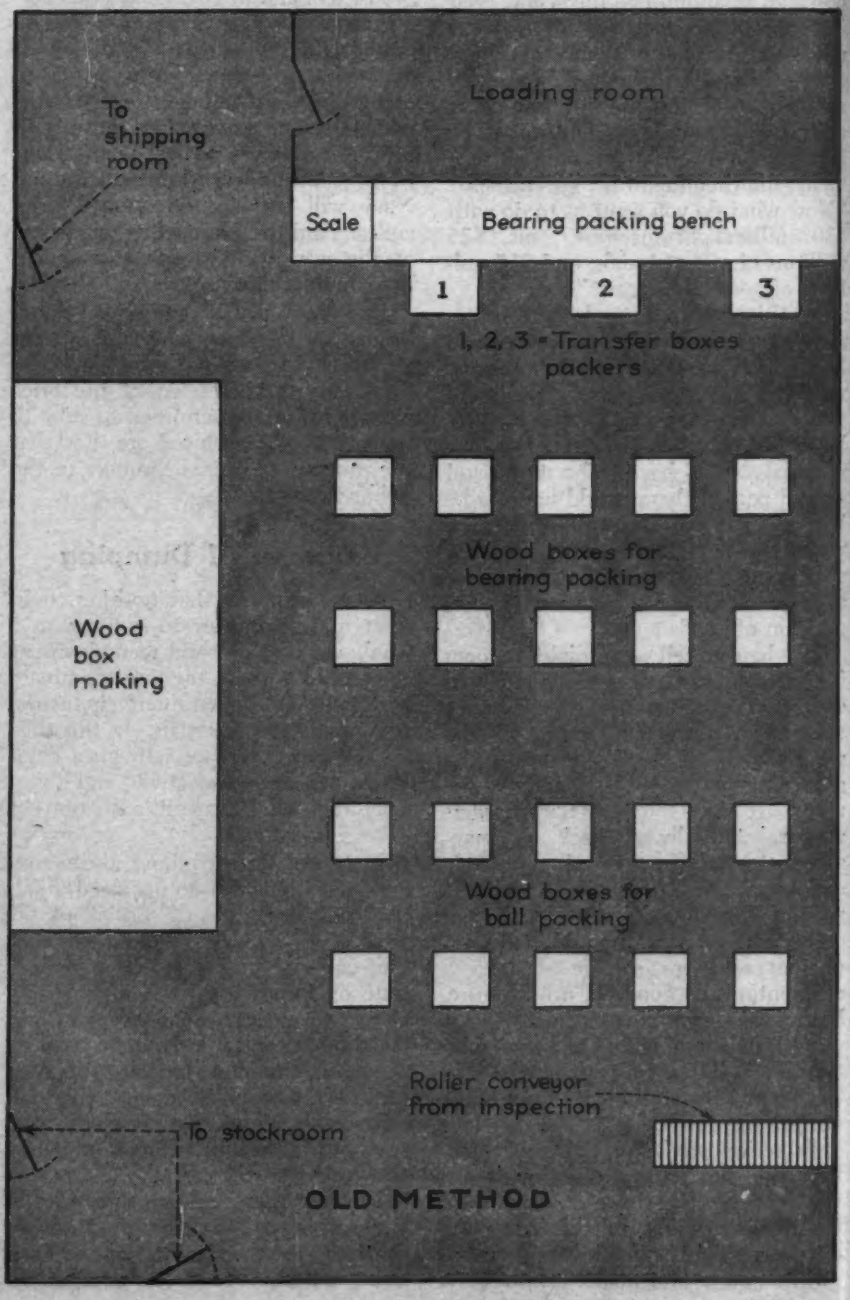
UNTIL 1939 we had always shipped our product, balls and assembled ball bearings, in wooden shipping containers of 200-lb. capacity. Moreover, this business is what might be called "off the shelf"—that is, shipments may be made to as many as 100 customers in one day with quantities to one customer varying from one to fifty cartons. With a great variety of sizes, this means that production, generally speaking, runs to stock, and shipments are made from stock. Some large orders, to be sure, are taken from finished operation points directly to packing and shipping, but this procedure constitutes only about 20 percent of the total business.

In 1939 wood for shipping cartons became difficult to get, and it was decided to experiment with paper cartons. Samples were secured of the same capacity as the wooden box, roughly 1 cubic foot, and loaded with defective material. These cartons were shipped to customers from coast to coast, by routes involving the most frequent transfers, with the request that they be immediately returned. All the cartons came back in good condition, although they had traveled over twice the distance normally required. In some cases the product was packed in bulk, although real orders are segregated into small paper boxes within the shipping carton. It became evident then that the paper carton could be adopted successfully—at a cost, incidentally, of one third that of the wood box.

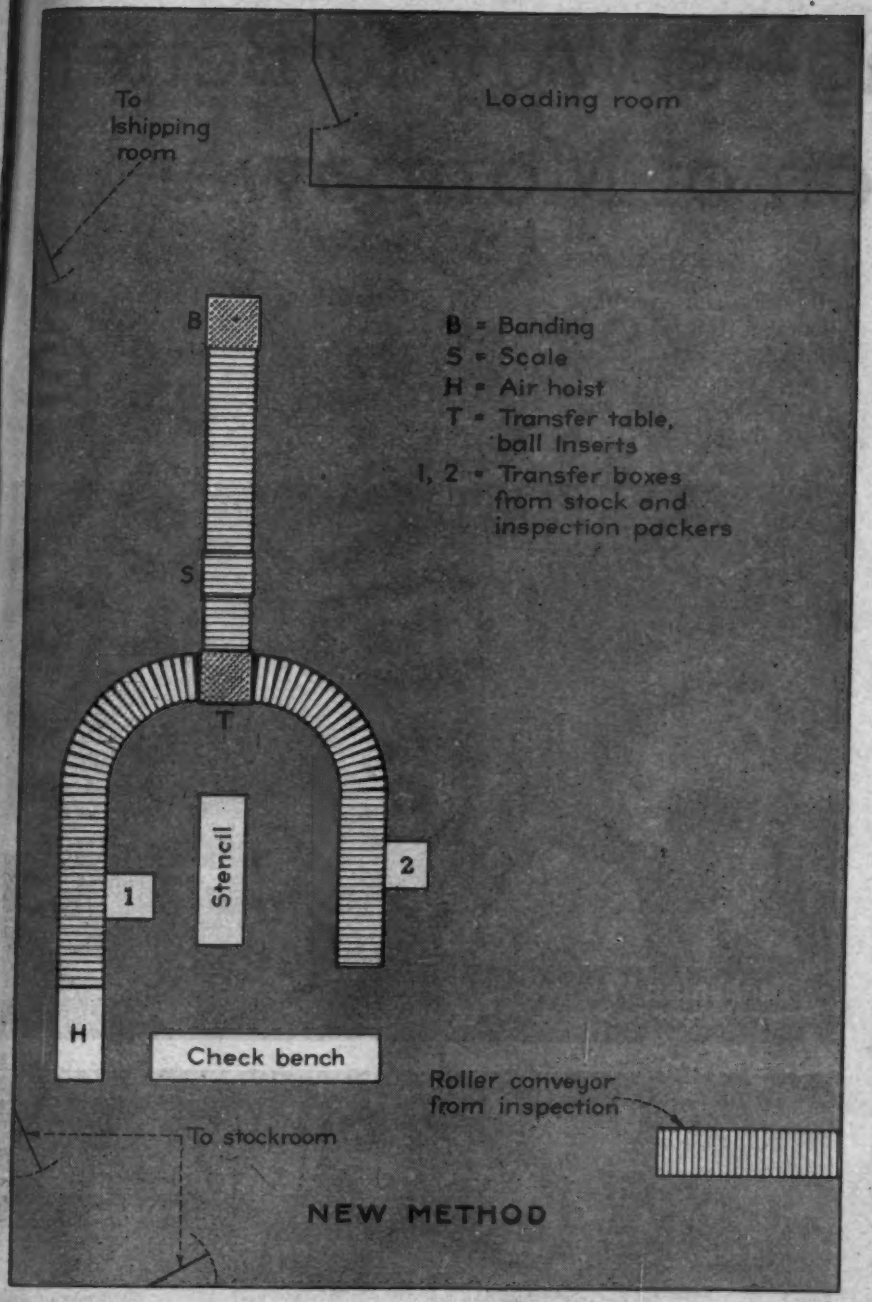
The old method of wood box packing was largely a floor operation; the weighing for the bill of lading was by dial scale set flush with the floor. With the increase in war orders, it became evident that still another change was called for, in addition to the shipping carton change. Space was not available to handle the increased business in the old way, and manpower was becoming increasingly difficult to get.

At that time final carton packing and shipping, which included sealing and shipping paper preparation, were handled by one checker, one clerk, one shipping clerk, three packers, and one truck driver. With the new set-up, a 250 percent increase in shipments is handled by this same force, except that there are only two packers instead of three.

The major change was the installation of a roller conveyor 30 inches high and 21 inches wide. This conveyor is in the general shape of a tuning fork, with the two prongs adjacent



Shipping in wooden boxes was more expensive, took more floor space and more time. Boxes had to be made as well as packed



Roller conveyor and air hoist combine to save manpower, cartons instead of wood boxes conserve materials, new layout saves space, in packing and shipping bearings and balls

to the stockroom and the finished production points, and the stem ending near the truck-loading door.

At the end of one of the prongs is an air hoist. A trucker brings a packed carton by two-wheeled scoop truck; a press of a button elevates this box to the conveyor, which it rides to go through stencil, packing slip insertion, and sealing operations and then on to the truck loading dock. Products that must be selected from stock are placed in a transfer box, on casters, of the same height as the conveyor and moved into position along the second prong of the conveyor for easy packing into the shipping carton. Either prong may, of course, be used for packing, depending upon the character of the orders, but the air hoist is always used to elevate packages from the floor.

After checking, packing, and stenciling, the boxes are pushed to a transfer plate with ball bearing inserts that connects the prongs of the conveyor with the stem leading to the truck dock. The first section of this stem conveyor is welded to the platform by the dial scale, the tare weight of which had to be adjusted to compensate for the weight of the conveyor section. At the end of this section of the conveyor is a second plate with ball-bearing inserts. At this point the loaded carton has to be shifted around during the wire banding operation, and the plate makes this shifting much easier. A slide leads to the truck loading area.

A question may arise as to the great increase in business with the same clerical force. Here another improvement was made: Instead of making the packing slip and bill of lading out by hand, a wide carriage billing machine was installed which permitted both these documents to be typed with merely a shift in the carriage from one to the other.

This arrangement has been in operation about three years, and it works perfectly. Lifting has been entirely eliminated, because all work is done at convenient work level. The flow is continuous from the start on the conveyor at the checking bench to the slide leading to the loading area. Space is reduced by some 40 percent; and two packers only are required as compared with the six or seven who would have been required with the present amount of business and the old floor system and wood cartons.

IF YOUR COPY OF *FACTORY* IS LATE—

Be patient, please. The nation's transportation system is severely loaded. The delay may be unavoidable. Allow a few extra days before writing us. Both the publisher and Uncle Sam are doing everything they can to get your *Factory* to you on time

Upgrading—a Way to Better Utilization of Manpower

A CAREFULLY PLANNED upgrading system under which *all* talents of existent employees are thoroughly classified and promptly utilized when needed has enabled the Denver Ordnance Plant, operated by the Remington Arms Company, to fill many important jobs that would otherwise be hard to fill, and at the same time has raised to an unusually high level the standard of worker morale.

There are no "blind alley jobs" in the Denver plant. No employee is penalized because he is doing an especially good job in a minor position or because his department has failed to expand while others were expanding. Likewise, the fact that he accepts a job here in some line other than his chosen one does not slow his progress. When better jobs open up, every man —wherever he is working—who has the qualifications for those jobs receives impartial consideration.

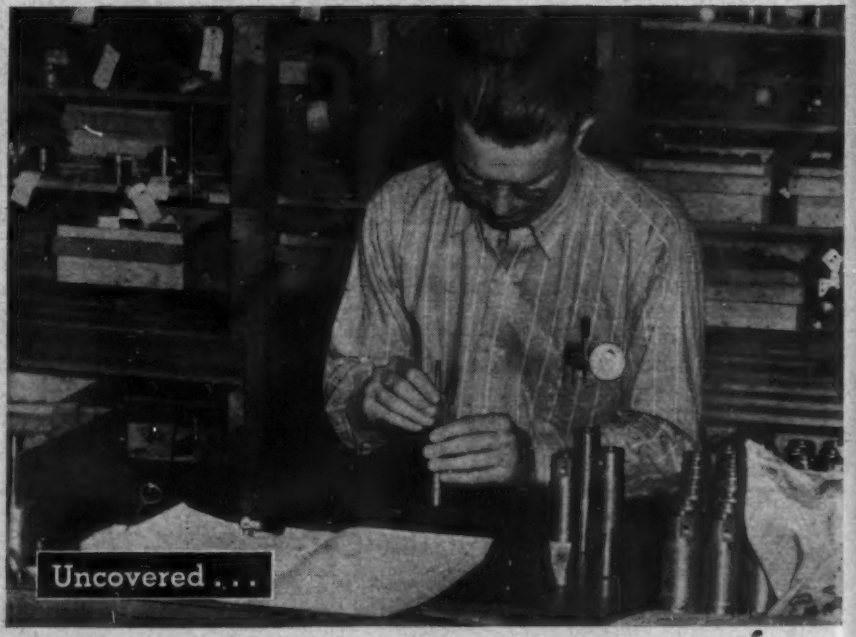
Employees Promoted

Today, this plant is averaging between 300 and 700 transfers a week, all of which represent promotions for old employees. Sometimes a man moves up a notch in his own department. More often he is transferred to another department. Frequently the type of work he is doing will be changed completely.

For example, should the company lose a good office-machine man, it would be almost impossible to replace him from the outside. But study of the cross reference file in the personnel department would reveal at least five men with ten to twenty years' experience in this line, not to mention one man on the guard force who had 30 years of experience. It would be much easier to replace the guard than to find a competent mechanic. So, he would be transferred. Both the war effort and the individual would be served significantly by that change.

To facilitate transfers, four separate employee record files are maintained —an alphabetical file, a rate classification file, a departmental file, and an alternate occupational file. The alphabetical file carries routine information, such as name, job title, class, building in which worker is employed, service date, age, and sex. The rate card duplicates this information and in addition lists education, social security number, and occupational abilities.

The departmental files, which are carried in the employee departments, duplicate the rate classification files but are kept in service record order; notations on individual performance also are appended from time to time by the area supervisor. The alternate occupational files, which are central-



When better jobs open up at the Denver Ordnance Plant, every employee who has the qualifications receives impartial consideration. To wit, the case of George Perry, an inspector in the receiving department, whose adventures in upgrading are depicted on the facing page

ized, list alternate skills according to type by service dates. For instance, names of all men on other jobs who have qualifying experience as carpenters are filed together according to service age.

To make certain that all skills usable in the plant are recorded, it is now planned to make a follow-up employee survey of this subject. Every worker will be asked to check a prepared list of the skills needed and indicate the ones in which he has had experience. The idea behind this is that, not being fully familiar with the whole plant, some previously hired people may have neglected mentioning certain abilities that might be valuable.

When an opening occurs in any department, the personnel organization obtains from the files a list of all individuals who, on the basis of past experience and qualifications, would seem eligible. The names on this list are then discussed with area supervisors to determine current performance records. Where several men have all made excellent work records and are highly recommended by their supervisors, the choice is made on the basis of service record.

The personnel department is sufficiently staffed to carry on intensive investigation work on every opening. No limit is placed on the number of employees who may be considered for a given job. The size of the list is determined only by the number of the employees apparently eligible.

Although this procedure is time-consuming, the final results well justify the expenditure. Thorough investigation may reveal striking differences between two apparently eligible men —one may have certain not-too-obvious extra qualifications that put him head and shoulders above the other.

Obviously, the work has a tremendous morale building effect. The man who, because of certain past experience is voluntarily taken out of an unimportant job and given a significant promotion, never gets over talking about it. He becomes thoroughly sold on the system that gave him his chance, and never misses an opportunity to encourage others. This attitude is reflected everywhere, not only in quantity of production but also in the quality that is so important in Ordnance materials.

Everyone Satisfied

Just as great care is taken to see that department heads are satisfied with transfers and that transferred workers fully understand the responsibilities of their new jobs as in selecting the eligibles. Plant interviewing procedure has been worked out to cover these points.

When an employee has been selected as a possibility for transfer, the employment office interviewer first gets in touch with that man's supervisor and suggests that they examine his departmental file card. The decision as to actual eligibility is based on the employee's record plus the supervisor's comments.

If the prospect is well recommended, he is called in for a conference and told that his supervisor has recommended him for promotion—the part of supervision is always emphasized. If the employee is interested in the proposed transfer, he is given a careful outline of the nature of the job, the working conditions, the rate progression involved, the hours, and other advantages and disadvantages. No room is left for misunderstandings.

Where a person is being transferred from one area to another, the new supervisor involved is not only given an advance opportunity to check over the man's record and to talk to his old supervisor, but he also meets the new man before the actual transfer. It is up to the supervisor to do any questioning he wants done in advance of the change, making reasonably sure that everyone is going to be satisfied.

Should an employee turn down an offer for advancement, this fact, with details of the circumstances, is noted on his record. Although such occurrences would not bar a man from future opportunities, too many turndowns on his part might be considered to indicate a lack of initiative.

Except where interests of the war effort demand such action—and in every case it must be approved by management—the hiring of new personnel is limited to the lower wage

Drafting is one of Perry's alternate occupational abilities, so when the drafting department puts in a call for help, his name is turned up in the personnel department's files. So he is interviewed by the receiving department foreman and the plant's senior interviewer. Result: A transfer to the new job and another successful case in making the best possible utilization of existing manpower

Last Name	First	Middle			Serv. Date Co.
Present Job			Bldg.	Sym.	Serv. Date Dept.
Draft Status	Age	Sex			ALTERNATE OCCUPATIONAL ABILITIES
Grade School	Yrs.	Grad.			1.
High School	Yrs.	Grad.			2.
College	Yrs.	Grad.			3.
Degree					4.
Trade School					Soc. Sec. No.
Business School					Foreign Language

RECORD OF TRANSFERS OFFERED

Job Offered	Date	Disp.	Reason for Refusal

Remarks

TRANSFERS

Date	Sym. PR. No. Bldg.	Occupation	Rate Class

Remarks

To facilitate transfers, four files are kept. Here are shown both sides of the employee's record, giving full information about his education and skills

classifications, the upper bracket jobs being retained for old employees. With the aid of the alternate occupational files and a series of unusual job relations charts, this company is able to fill promptly, fairly, and efficiently a majority of the openings that become available.

Since not nearly all employees have any number of different skills, much upgrading must be done on an intra-departmental basis—in relation to actual plant experience of workers. It is in planning for these promotions that the job relations charts become valuable. The charts outline logical work relationships and show how employees on jobs having lower classifications are to be considered for promotion in their own lines.

Under this setup, all positions are classified in 17 different alphabetically named groups. These groups, in turn, are subdivided into a number of related divisions, each containing its own list of jobs in order of their rate value.

For instance, in Group A, which lists jobs ranging from a tool inspector to an instructor in the gage department, there are nine divisions. In some divisions, only one job is listed; in others there may be a dozen. But in each case, the jobs at the bottom of the division list are directly related to those above. And all the jobs in an entire division list are in some way related to the others in the group list as a whole.

Thus, a man in the bottom division of Group A—Division 9—would progress not only up his own list but on the basis of ability and service record could move into the next division and possibly on up to the top. Each step up the line would put him in a higher rate classification. But his advancement would be always in line with a definite pattern—into jobs which were in some way related to his original experience.

With strictly non-skilled jobs, persons in the first five classifications below the one in which the vacancy occurs are all entitled to consideration on the basis of service record and performance, the service record being the deciding factor where other things are equal. In the semi-skilled brackets, employees desiring to do so may take special training that would fit them for advancement. In the highly skilled occupations, however, direct qualifying experience, either in the department or in previous work, is required.

Of course, all transfers are subject to approval of the medical department. Where there is disapproval from this source, the employee recommended for upgrading is then placed in line for other jobs within his physical ability.

The whole upgrading procedure has been placed on a plantwide merit and service record basis. The employee automatically gets his chance for advancement. And, manpower is conserved through maximum utilization of most important skills.

HEALTH AND SAFETY

for best utilization of manpower

Splashes of hot metal tell the story of what might have happened

A 4-PLANK PLATFORM FOR 1944

- ☆ PLENTY OF GOOD NUTRITIOUS FOOD
- ☆ AN OPPORTUNITY FOR RECREATION
- ☆ BEST POSSIBLE MEDICAL SERVICE
- ☆ FREEDOM FROM FEAR OF ACCIDENT

FIFTH ANNUAL SPECIAL SECTION ON THE SUBJECT OF HEALTH AND SAFETY FOR WORKERS IN INDUSTRIAL PLANTS

FACTORY MANAGEMENT AND MAINTENANCE • JANUARY, 1944

VOLUME 102, NUMBER 1 • JANUARY, 1944

Plank No. 1 in Health and Safety Platform for 1944

☆ Plenty of Good Nutritious Food

AMERICAN INDUSTRY has probably built more cafeterias and installed more feeding facilities in the past 30 months than in all the preceding 30 years. As a result, millions of workers today are able to get the nourishing food they need, and get it at the job.

Yet millions of other workers are denied this opportunity, and the overall situation is still bad enough to elicit this mid-December comment from WPB Chairman Nelson. Said he, calling upon war industries to provide or to improve in-plant dining facilities for war workers:

"In many places the vastly increased employment in essential industries on a two- or three-shift basis has overtaxed the ability of the few neighboring shops to serve suitable foods to large numbers of workers during their brief mid-shift meal.

"So many wives have joined the force of war workers that it is increasingly difficult for workers to rely on the old-fashioned lunch box or dinner pail."

It is plain, then, that there is still a man-sized job to be done and it is to help industry do the job that FACTORY here presents case material in industrial feeding practice. This material has purposely been selected from plants of all types and sizes. From the examples given it becomes plain that there is some one answer for every plant—even the plant that is miles away from kitchen and dishwashing facilities.

Emphasis on a Balanced Diet—*Warner & Swasey*

Wholesome food for war workers is recognized by the Warner & Swasey Company, Cleveland, as essential to efficiency on the job and to lowered absenteeism. The company now feeds more than 80 percent of total personnel in the plant.

Of this total, about half patronize hot lunch wagons, which tour each department during noon periods. From them, employees may supplement home-packed lunches with hot soup, beverages, and other items, up to and including a full meal. There are two cafeterias presently in operation, each of which is open to accommodate the personnel during two 30-min. lunch periods for each of the three daily shifts.

The menu is planned by a graduate nutritionist whose efforts are directed toward supplying employees with balanced diets. A manual of nutrition information, containing recipes and menus prepared with consideration for existing ration limitations, is made available to employee homes. Visual education, involving attractive "reason why" displays, is used in the cafeterias to emphasize the value of proper attention to home cooking. Motion pictures in color, which deal with the value of various dietary elements, also are shown.

Much of the congestion at the main food counter has been eliminated by opening a pre-work snack bar just before the start of each shift. This snack bar likewise provides supplementary items for those employees who bring part of their lunch from home but prefer to take advantage of the convenient facilities of the cafeteria lunchrooms during noon hours.

Of further help is the fact that menus are posted throughout the plant in advance of each meal, so that no one needs waste time in the serving line to decide which items of food are preferred.

The problem of making change has been reduced to a minimum by spe-

Attractive "reason why" wall displays are used in the two Warner & Swasey cafeterias to emphasize the importance of good home cooking. Colored movies on various nutrition subjects also are shown

cial change dispensers, which deliver the proper amount in relation to the total rung up. Paper money is clipped together in amounts that facilitate handling of large bills that are tendered in payment.

The mechanics of the serving problem are backed by expertly designed and efficiently manned kitchens. In planning its cafeteria, Warner & Swasey elected to provide ample seating capacity and pleasant surroundings for its lunchroom. Remaining space available necessitated designing a kitchen 30 percent smaller than customary in relation to the volume handled. The result has been a considerable saving in steps for the chef and is actually a more convenient and workable arrangement than would have been possible in larger kitchen quarters.

Cafeteria Committee—*Ryan Aeronautical*

When Ryan Aeronautical Company, San Diego, Calif., first opened its nonprofit employee cafeteria, an estimate was made of the number of employees who would make use of this new service. Today more than twice that number are eating in the cafeteria.

Quick service, flavorsome meals, and low prices have been responsible, together with the fact that the employees, through their cafeteria committee, have had a voice in planning the menus and services. This committee consists of four permanent representatives—a spokesman for the management, an expert dietitian, a member of the public relations department, and the famous chef who has personal charge of planning and serving meals. Other members are picked from the various departments on a basis of seniority, and each serves for a month. The purpose is to collect suggestions and complaints and air them at a spot where they can be given proper consideration.

Menus are planned more than a week in advance and sent to the dietition who checks to make sure they contain the proper nutritive qualities.

Emphasis is placed upon the value of proper nutrition in the induction class which every new Ryan employee attends. Each individual is asked to write down his menu for the previous day and figure for himself how near he came to fulfilling normal requirements for each day. This portion of the class is conducted by the dietitian who shows in graphs and pictures the part that various nutritive elements play, and points out the foods that supply these needed substances. She also prepares a regular column for the employee magazine in which she discusses nutrition problems.

No swank in the Ryan Aeronautical cafeteria, but employees enjoy quick service, tasty meals, low prices, and a say in its management

Warner & Swasey menus are planned by a graduate nutritionist whose efforts are directed toward supplying employees with balanced diets

Diet Consultation Service—*Eastman Kodak*

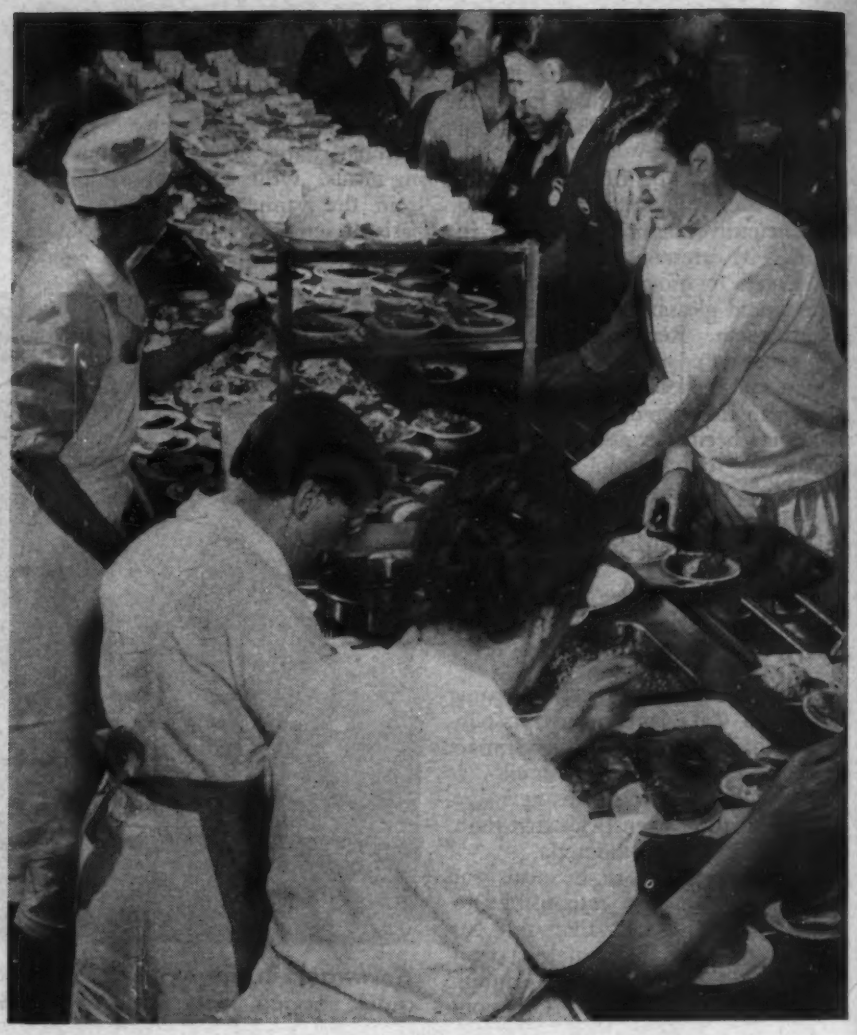
Of the many ways used by Eastman Kodak Company, Rochester, N. Y., to improve the eating habits of its employees, the nutrition consultation service has been the most successful. It began with one consulting dietitian in the medical department. Now there are three who give full time to individual instruction on diets to modify weight.

A food history is taken, and rec-

ommendations are made. A weight chart is kept which helps the patient watch his progress when he reports back for a check-up. There is nothing compulsory about any of it, although many times a doctor passes an overweight or underweight applicant because he is pretty sure the nutrition adviser will whittle him down or build him up.

Kodak also knows that people have capricious appetites during night hours. They are never sure whether they want breakfast, "brunch," lunch, or dinner. A special effort is therefore made to take care of night workers. A good breakfast, the company has learned, is necessary because, in many instances, when the worker arrives home, his war-worker wife has already gone to work and, if left to his own devices, he will probably do without. It also helps those on the day shift who have no one to prepare breakfast for them at home, or those who are not hungry when they leave but "starved" when they reach the plant.

A special lunch has also been a factor in inculcating good eating habits. It includes a protein dish, two vegetables, milk or other beverage, bread and butter, and a choice of dessert or fresh fruit—all for 30 or 35 cents. When the "special" was first inaugurated, a picture of a sample meal was displayed on posters in the plant. Occasionally "extras," such as pie or cake *a la mode*, or even a chicken dinner, are used to increase sales appeal. The cafeteria management has found this an effective method of getting employees into the habit of ordering nutritious meals.



Luncheon line-up at one of the three cafeterias that serve good food at cost at Bell Aircraft's assembly plant at Niagara Falls

Hot Meals for All Who Want Them—*Bell Aircraft*

At its new assembly plant in Niagara Falls, N. Y., Bell Aircraft Corporation has three cafeterias which it operates for the employees at cost—two in the basement for factory employees, one on the main floor for office workers. The two in the basement serve breakfast, lunch, and supper every day, and hundreds of employees eat all three meals there. The office cafeteria serves only breakfast and lunch, but office workers may have their evening meal in the downstairs cafeteria if they wish. The same dinner is served both at noon and in the evening, but the wide variety of foods served allows the employees to select two completely different meals.

For between-meal pick-me-ups employees may buy chocolate bars, cookies, raisins, peanuts, and other foods of high caloric content from snack bars in the cafeterias or from candy machines.

There is no regular dining room in the Buffalo plant. Until recently, the workers have been able to obtain sandwiches, coffee, pie, and fruit from wagons operated by a concessionnaire. Now the company has assumed the responsibility of feeding its employees hot lunches like those served at Niagara Falls.

Accordingly, in December, a fleet of 25 rolling cafeterias got under way. Twenty are rolled to stations in the plant. Workers are served in a regular cafeteria line, place their dishes on Navy mess trays, and eat on benches which have been set up. The other five are used in the offices.

Food for these rolling cafeterias is cooked in one large central kitchen. Each cafeteria contains electrical heating and refrigerating compartments, which are brought to the proper temperature before loading and are kept at that temperature by being plugged in at their stations.

The cafeterias hold enough food to serve 300 people each and are serviced by the old lunch wagons, which the company has purchased. Busy 24 hours a day, they not only serve regular dinners during lunch hour for each of the three shifts but are also on hand with sandwiches and pies between shifts.

Health-for-Victory Club—*Woodward Governor*

Through a Health-for-Victory Club, members (employees) of Woodward Governor Company, Rockford, Ill., have received many helpful menus, recipes, and food hints. A week devoted to nutritional education is soon to be instituted at the company's school meetings.

The company has instituted a nutritional education program in which

the medical advisor and the head of the Rockford Nutritional Center have given talks to all members on the importance of correct foods. Wives of members were encouraged to attend downtown meetings.

The cafeteria provides 24-hour service six days a week for approximately 1500 members, and serves some 1300 meals daily. Breakfast is served from 5 to 8 a.m., and lunch hours range from 10:45 a.m. to 1 p.m., 5:30 to 7 p.m., and 2:30 to 3:45 a.m. The manager and her assistant are home economics graduates and experienced in quantity cookery. There is a staff of twelve people on each shift, which includes two cooks and a cashier who is in charge of the crew and handles the money. In addition there are two pastry cooks, a salad girl, coffee girl, and four janitors.

Two-toned tile walls, tables, and metal appurtenances are always gleaming and immaculate. The girls wear harmonizing uniforms in shades of yellow and brown. It is possible to seat 288 people at one time. Dining room, kitchen, dishwashing room, and stockroom are well ventilated and lighted. Equipment includes two walk-in refrigerators, a quick-freeze unit, electric bake oven, stove, potato peeler, and double section dishwasher.

Menus offer a wide variety of nutritious meals to suit all tastes. There are three entrees, usually one requiring no meat, one that has "solid" meat, and one other. Two sample entree menus might be (1) spaghetti, liver and onions, chop suey, or (2) roast pork and dressing, creamed chicken on biscuit, halibut steak.

For every meal two kinds of soup are always offered, usually one clear and one cream. Three or four fresh vegetables are served, also a wide variety of 5-cent fruit and vegetable salads. Members face a problem when trying to decide which of seven kinds of home-made pies to choose. Cake, two kinds of pudding, fruit in season, and ice cream when available are served. Prices vary from the 25-cent lunch of the girl office worker to the 50-cent complete hot meal of the shop worker.

On major matters of policy and price, the manager consults the cafeteria committee, comprised of members from shop and office, the supervisory staff, and top management. The cafeteria is financed in part by the proceeds of its sales. The company assumes the cost of heating, lighting, and maintenance.

Food From Kitchen Miles Away—*Chance Vought*

How to feed war workers hot, nutritious meals at a plant miles away from kitchen or dishwashing facilities? The answer, as worked out by Chance Vought Aircraft division of United Aircraft Corporation, is simple. Today, workers at the Bridgeport plant, six miles away from the main plant at Stratford, Conn., are served one, two, and even three complete hot meals.

Food is prepared in the kitchen of the Stratford plant and rushed by truck in insulated containers to the Bridgeport plant, where it is transferred to steam tables, ready to be served into paper cups and containers. Every plate, cup, spoon, and bowl used is of paper, which not only eliminates all dishwashing and sanitation problems but also expedites service.

So successful has been this "cafeteria-without-kitchen" that a similar feeding unit is under construction on the grounds of the main Stratford plant for workers who are now too far away from the cafeteria to be able to make it there and back in the half-hour allotted for lunch.

Chance Vought has learned, as other plant operators all over the country are learning, of the high regard in which the worker holds his hot meal. Sandwiches and beverages only were available on Saturday night and Sunday because of light shifts, but recently the employees approached management with the suggestion that, if "you will give us a hot meal during those hours, we can assure a big increase in the number of men and women willing to work those shifts."

Much of the credit for the success of the feeding enterprise at Chance Vought goes to the concessionnaire who works so closely with management that few realize he is an independent operator. Employees go direct to plant management with suggestions or grievances about food. "And," says the concessionnaire, "don't think they won't complain if given cause." However, despite the many wartime difficulties, such as food rationing and shortage of experienced help and equipment which beset cafeteria service these days, complaints are few and far between. Congratulations are still pouring in on the Thanksgiving turkey dinner, complete with cranberries and pumpkin pie—all for 50 cents.

No actual dictating as to what the worker should eat is advocated at Chance Vought but "we have a well-balanced meal here for them and hope they make the right choice." A full-time dietitian is on hand to give advice about diets to any worker interested and to figure out proper vitamin and calory combinations. "Jenny on the Job," a glamorous female in slacks makes her appearance on restroom and plant wall posters which cleverly glorify such virtues as: "Jenny Eats Man-Size Meals"—along with "Jenny

Mobile canteen takes care of Chance Vought workers who are located more than six minutes away from the cafeteria in the main plant

Electrically heated and refrigerated trucks serve hot, nutritious food to production workers in seven manufacturing plants of General Cable Corporation. These mobile cafeterias make the rounds on fixed schedules, thereby making it possible for workers who have a limited wartime lunch period to eat without leaving their departments

Gets Her Beauty Sleep," and "Jenny Has Fun After Work."

To those employees at the main plant who work over six minutes away from the cafeteria, a mobile canteen carries sandwiches, beverages, and paper service at mealtime. At the moment, the employees are asking for a mobile unit to make mid-afternoon and mid-morning rounds with refreshments. The personnel manager has been trying to install one, but has been hampered thus far by the milk shortage; no neighboring dairy will agree to furnish the necessary amount of milk, even enough for coffee use only. Which brings up the question of food rationing of war workers, a not too popular expedient with Chance Vought cafeteria management who, like other industrial feeding operators, must spend hours trying to work out enough ration points to feed a horde of men and women with the lusty appetites induced by physical labor. To forestall complaints on this score, signs are posted around the cafeteria explaining why some food items are curtailed or missing.

Produce Grown on Own Farm—*Wiremold Company*

In an effort to provide its workers with nutritious food during these times, when point rationing makes it difficult for families to get enough of everything, The Wiremold Company, Hartford, Conn., opened a company-operated cafeteria last April. At reasonable prices, employees may select from a varied menu, including soup, two or three hot dinners, salads, twelve to fourteen kinds of sandwiches on their choice of white, whole wheat, or rye bread, and all kinds of desserts.

Severe food shortages faced by all at home have in most part been avoided at the cafeteria by diligent study of the market offerings, by using produce grown in its own garden plot on factory property, by stretching available red points with chickens and eggs from its own poultry farm, and by raising pigs purchased by the cafeteria and taken care of by company employees with farming experience.

Between nine and ten in the morning, a coffee cart brings a snack to the employees. It serves sweet buns, coffee cake, hard rolls with butter or marmalade, doughnuts, fruit juice, tomato juice, coffee, milk, candy, chewing gum, and soft drinks.

A typical menu in the Wiremold cafeteria includes soup, roast beef with potato, vegetable, and bread, waffles and maple syrup with bacon or sausages, chicken chow mein, sandwiches (American cheese, bologna, liverwurst, peanut butter, egg salad, tuna fish salad, salami, pressed ham, peanut-butter-and-jelly, cream-cheese-and-olive, boiled ham, sliced chicken, and chicken liver and chopped egg—on white, whole wheat, or rye bread), cottage cheese and pineapple salad sandwich plate, fruit salad sandwich plate, and Bismarck herring and potato salad. Dessert choices usually include pies and cakes, cookies, fruit, puddings, ice cream, and sherbet, and there is a choice of coffee, tea, hot chocolate, milk, or soft drinks.

The cafeteria has its own deep-freeze unit which has proved a real aid in this battle of points, since it is possible to buy sides and quarters of beef, whole lambs, etc. (which, purchased this way, are lower in point value), then to cut them up into chops, steaks, and hamburg, and store them in the deep-freeze unit until needed. In the same way, when feed gets low, the cockerels of the Wiremold chicken flock are killed, cleaned, and frozen for later use.

On one day every week the cafeteria offers for sale to employees those eggs from its poultry farm which are in excess of needs. These are sold at prevailing market prices.

The management realizes the value of attractive surroundings during mealtimes, and made a special effort to equip the cafeteria with good-looking, comfortable booths which are painted in a pleasing shade of blue. Music selected for broadcasting over the loudspeaker system during eating periods is of the restful, dinner type.

Feeding Fighters on Home Front—*Remington Arms*

People must eat to live, to fight. This was a fact that Remington Arms Company, Inc., management knew, and to meet such an emergency in each of the eight plants under Remington ownership or operation, cafeterias were installed. The installation of cafeterias was necessitated by the fact that most of the plants were located in places rather remote from restaurants or other eating places.

The ability and knowledge of experienced restaurateurs were called upon and, in this manner, Remington solved the problem of providing food and nourishment for approximately 85,000 workers.

Of the plants operated by Remington, the Lake City, Mo., Ordnance Plant may be taken as an example. In the Lake City cafeterias, club breakfasts are served in the morning. Ham, bacon, sausage, eggs, potatoes, fruit juices, cereals, coffee, tea, or milk, and other nourishing foods make up the menu. For the main meal, on either shift, two meats or a meat and fish entree are offered.

Eighteen girls are engaged in pre-

paring vegetables for salads during the two shifts in which the five cafeterias are open.

Remington's management realizes that, to do a good job, every person, either on the fighting front or production front, must be well fed. The eating facilities which Remington has offered its employees has, according to a Remington official, played an important role in that company's remarkable accomplishment in small arms and ammunition production.

A Sandwich, a Salad or a Complete Meal—*Bulova*

Food prices in the employees' cafeteria at Bulova Watch Company, Long Island City, N. Y., are 20 percent lower than corresponding prices in the neighborhood restaurants. Add good cooking, fast service, and attractive surroundings to explain the fact that it is now serving twice as many hot dishes as it served when it was opened six months ago.

The low prices are easily maintained by the concessionnaire because the company owns and supplies all equipment, charges no rent. The good cooking and excellent service may be laid to the fact that the concessionnaire is an experienced restaurateur. The attractive surroundings may be attributed to location in a pleasant building of Swiss chalet type with tile floors, rough plaster walls, wagon wheel lighting fixtures, huge corner fireplace, and soft plaid window curtains.

A compete meal, including bread and butter, beverage, and ice cream, costs 30 cents. Two entrees are offered. On a given day the Bulova workers may choose for example between a vegetable dinner and a veal chop with potato and a second vegetable. Or, some other day, it may be that chow mein *en casserole* is the featured dish on the menu.

Workers eat in two shifts—from 11:30 to 12 and 12:15 to 12:45. About 85 percent of the company's employees are women and girls—and, because the work is light, many of them rely on the home-packed lunches which they bring with them and eat in the cafeteria. Some 600 others buy anything from a sandwich to a salad to a complete meal.

Wholesome food at 20 percent less than neighborhood prices attracts large numbers of Bulova workers to the company's Swiss chalet

Behind the scenes with a chef in one of the five cafeterias in the Lake City Ordnance Plant operated by Remington Arms Company

The girls pick up their own dishes; separate silver, cups, and plates; and place them in receptacles as they leave the cafeteria.

Music With Their Meals—*Bullard Company*

An all-employee entertainment unit, consisting of a five-piece orchestra, a master of ceremonies, and a girl and a boy who sing, tours the two cafeterias at The Bullard Company, Bridgeport, Conn., on both the day and night shifts, and puts on a compact, fast-moving program.

Foundry employees followed the example and have established their own orchestra which plays from a platform near the parking lot.

CONTINUED ON NEXT PAGE

Plank No. 2 in Health and Safety Platform for 1944

☆ An Opportunity for Recreation

NOT NEW, this idea of providing recreational facilities for industrial employees, but a problem that assumes new importance and develops new phases under the stresses and strains of wartime operation. Industry has long known that recreation programs pay off in better morale and consequently greater production.

The problem, in most plants, is how to organize the program and how far to go. And the answer is relatively simple: Turn the job over to a properly constituted committee of employees and let them run their own show.

How far they go, and the direction they take, will depend upon many factors. The big-city plant, for example, may find it difficult to get people to stick around after work. The transportation situation may make it impossible for workers either to stay or to return. And of course a special problem is imposed in the plant that is working round the clock! What to do for the people on the second and third shifts?

All these and many other aspects of the problem have been answered in one or another of the plants to which FACTORY has gone for the examples of good practice that follow. The plants selected run all the way from the machine tool plant that has been doing business at the old stand for many, many years, to the sprawling aircraft factories that are numbered among the phenomena of present-day production. Each in its own way is doing an outstanding job of providing workers with the opportunities for play and relaxation that are so vital to the success of the war effort.

Bowling Most Popular—*Consolidated Vultee*

Coordinated through the employees' service department, the activity and recreational program at the Nashville Division of Consolidated Vultee Aircraft Corporation has been steadily gaining momentum since the employment about a year ago of a full-time supervisor.

At this season, bowling is in full swing, with more than 7 percent of Nashville-Convair personnel partici-

Social scene in Nashville. Dancing is one of the most popular forms of recreation with Consolidated Vultee employees. The Convair Vulcan Club often sponsors gala events like the one shown above

pating in the several leagues for both day and night shifts. With many actively taking part in this popular sport and numerous others enjoying the games as spectators, bowling is among the chief topics of conversation during fall and winter months.

Basketball is another popular indoor sport at the Nashville Division. Men's and girls' teams opened the current season with much fanfare in a packed auditorium—to the accompaniment of an Army band, and with the aid of a bevy of shapely cheerleaders clad in Convair colors. The Bomberettes are one of the country's leading girls' teams, and have won 16 of the last 18 games played.

During the summer, baseball and softball are the center of interest. With a better-than-average baseball nine entered in city league competition, sizable crowds are attracted to the Sunday games. However, in point of employee participation, softball takes the spotlight throughout the outdoor sports season.

In addition to a union-sponsored softball team entered in a commercial city league, there are eight day-shift and eight night-shift departmental softball squads competing twice weekly. On the average, these squads comprise about fifteen men each, most of whom are given an opportunity to play part of every game. At the close of the season the winning clubs in these leagues are awarded handsome plaques and trophies.

Working hand in hand with the employees' service department in the recreational and activity program is the Convair Vulcan Club, which sponsors most of the social events. These include dances at local hotels and country clubs, and an annual company picnic.

Also during summer months a riding club for both men and women attracts a considerable number of participants. Recently a dramatic club, "The Convair Players," was organized and has been a decided success from the outset. A series of sixteen weekly talent contests was conducted during the past few months, the programs being held on a stage in the cafeteria during lunch periods. Vocal numbers, instrumental selections, comedy skits, and recitations were included in the programs.

Additional athletic activities are also regularly conducted, including golf with tournaments and blind bogey competitions with attractive trophies. A golf team represented the company in local tournaments, and fourteen intraplant, four-man teams competed in the various Convair-sponsored events during the summer. Considerable interest has been shown in the well-organized tennis program which has men's and women's teams representing the Nashville Division in competition with other industrial organizations, as well as singles and doubles open to all employees.

Minor recreational activities include participation in chess and checker clubs, department-sponsored outings (such as fish-fries, barbecues, hunting trips, and the like) which serve to promote good feeling among employees and indirectly act as a boost to production.

In the future it is planned to provide entertainment at least once a week, as well as community sings and the like, with some of the entertainers from outside the plant.

Among the facilities provided by the company in connection with the sports program is a spacious athletic field near the plant which includes a baseball and softball diamond and is suitable for other events, such as the "rodeo" that was used with great success to dedicate the field.

Basketball, with topflight men's and girls' teams, is ranking spectator sport at Consolidated Vultee. Here, Convair Bombers in action

Sport and Amusement for All—*Fellows Gear Shaper*

Recreational activities for employees at The Fellows Gear Shaper Company, Springfield, Vt., are under the supervision of a shop committee of five, reports Billy B. Van of the human relations division.

Outdoor activities include baseball, boys' and girls' softball, tennis, and barnyard golf, otherwise known as horseshoe pitching. Fishing and hunting contests run through summer and winter seasons—with prizes such as rods, reels, lines, hooks, hunting coats, guns, and ammunition.

Bowling contests and basketball, ping pong, and badminton games are held in the local community house.

There are skiing contests for employees on the many trails in the vicinity; there is a lighted ski tow less than

a mile from the Gear Shaper shop.

Two bands, one made up of employees on the day shift, the other composed of people on the night shift, provide recreation both for those who make the music and for those who sit and listen. In addition, there are two dance orchestras and glee clubs for men and women.

A band concert, vaudeville show, and dance is held every two months in the high school auditorium. Dramatic plays and comedies are produced four times a year by a group of Gear Shaper players. Proceeds from these entertainments go into the recreation fund for the purchase of equipment and trophies.

Hotel Floors Taken Over for Play—*RCA Victor*

Too little space and too little time have not been allowed to curtail recreational activities at the Indianapolis plant of RCA Victor Division of Radio Corporation of America. Sidewalks have been painted for paddle tennis, shuffleboard, and badminton courts, reports Mary D. Mobley, director of women's recreation. Grass areas surrounding the plant are marked off for croquet and horseshoes. There is an archery range where instructions are given periodically to those interested.

Complete sets of equipment are kept in weatherproof boxes at the play areas, because workers may have time for a game but not enough time if they have to check out equipment and return it when they are through playing.

The shuffleboard courts are lighted, and the sound of the disks scraping the sidewalk may be heard at any time of the day or night. There are benches everywhere for onlookers who are waiting their turn to play.

The company has leased two floors of a nearby hotel. The second floor boasts a gymnasium, two locker and shower rooms, and a fully equipped darkroom. The gym is the scene of many departmental and interplant basketball games. The sidelines are filled with spectators twice a week during league play. A heavy schedule starts with the night-shift workers' program at noon and carries on 'round the clock till 10 p.m. Hours are set for league and team practices in basketball, wrestling, and badminton. Special classes in tap or social dancing are conducted on request. Open hours are booked a week in advance.

Small boys of the neighborhood take over the gym on Saturdays. Many of their mothers work in the RCA plant and are reassured by the knowledge that their offspring are happily and safely occupied.

Big-city location does not curtail recreation activities at the RCA plant in Indianapolis. Shuffleboard court is always in use

One room is used for recreation committee meetings. Each department is represented by eight recreational chairmen—two social, two athletic, two outing, two welfare—who plan their activities six months ahead.

Duties of the athletic chairmen are to promote all sports activities; social chairmen—dances, parties, dinners, arts and crafts, hobbies; outing chairmen—picnics, hayrides, wiener roasts, hikes, and noontime activities; welfare chairmen—drives that are beneficial locally or nationally, including special services for men and women in the armed forces. Employees are urged to become acquainted with their chairmen and to offer suggestions. A month-by-month calendar of events is published.

Clubrooms on the third floor are open for table tennis, reading, lounging, and listening to records. Someone is usually playing the piano; music may be checked out. Rehearsals for stage and floor shows are held here.

Movies are shown twice a week in the cafeteria. On Wednesdays at noon about a hundred people attend chapel services held at the plant by a minister representing the Federation of Churches. Services last 15 minutes and include two hymns. There are two services, to take care of the staggered lunch hours.

A game library has been established so that employees may check out equipment over the week-end. This includes golf balls, bats, badminton sets, croquet, checkers, and chess.

Play Facilities for Entire Community—*Armco*

"Armco believes that good living conditions, in both home and community, are essential to the highest individual efficiency; that happiness, which every human being craves, cannot be obtained without them." That statement appears in "Armco Policies," which is looked upon as a sort of constitution of the American Rolling Mill Company.

One of the practical steps taken by Armco to provide good living conditions in the community has been the establishment of attractive and spacious recreation spots.

The company has plants located in Ashland, Ky.; Butler, Pa.; Hamilton, Zanesville, and Middletown, Ohio. At

Armco provides spacious parks for community use in each of the five industrial towns where its plants are located. Shown here is a glimpse of the "old swimming hole" at the Zanesville (Ohio) division

each place, extensive outdoor play facilities have been established.

Consistent with the company's interest in communities where its plants are located, there parks and playgrounds are open not only to employees but also to any family wishing to use them.

Middletown Armco Park consists of 400 acres, part of which has been converted into a community golf course. Woodland, rolling meadows, and brooks make an attractive summer playground equipped with slides, swings, outdoor fireplaces, basketball courts, horseshoe pitching courts, and other play facilities. A trapshooting club and a baseball park round out the physical recreational properties.

The ball park is the setting for a number of entertainments during the summer months. These range from band concerts to variety shows made up of radio personalities. Armco Park's rolling acres provide a hot-weather Mecca for the 'teen-agers and are the scene of many departmental and company club outings.

A defunct country club was purchased at Zanesville, and its facilities, complete with a swimming pool, provide the place for a broad program of sports. A full-time director is in charge during all the good-weather months.

Butler Armco Park is ideally situated on Slippery Rock Creek, an unusually attractive spot, and has proved a consistent favorite for summer recreation for company people and the community as well.

Equally large and complete recreation grounds have been established at Hamilton and Ashland. At the latter place, the company sponsors a Class C baseball team. Both the Ashland and Middletown ball parks are equipped with lights, and most of the games are played at night in order to provide a maximum opportunity for employee attendance.

With the advent of softball as a popular sport, numerous intraplant leagues have developed, with virtually every department in the plants participating in this sport.

Bowling is the major winter sport, and a large interplant tournament and banquet, with Armco management as host, was the athletic highlight of the year in peacetime.

Recreational facilities at each plant receive heavy use. A large measure of the success of the recreation program may be attributed to the diversified sports available. Care has been taken to attract all ages and all degrees of interest. Those who do not wish to participate, are lured out in the sunshine by comfortable facilities for spectators. Conveniently located, attractively laid out, and sufficiently large to obviate crowding, Armco's recreation spots not only provide healthful individual activity, but also are a meeting ground for the entire organization.

Perhaps the best summation of their popularity is the remark of one of the caretakers, "The only time I can relax is when it rains."

Community Athletic Association—*Rockford*

Plant personnel men in Rockford, Ill., have for years administered a cooperative recreation undertaking known as the Rockford Industrial Athletic Association. Thirty-one plants now hold membership. They vary in size from those with 500 employees to those with several thousand.

Industries are eligible for membership upon payment of $25 dues per year. Each plant has a representative on the board of managers. Officers are elected annually by the board. The

Three military bands—one of them is shown playing in a cafeteria—are among the more popular of the non-sports activities at Curtiss-Wright plants in Buffalo. Total band membership numbers 110

president appoints a leader or manager for each sport.

Dues are used to pay for the services of contest officials, for publications, etc. When additional funds are needed, an enclosed field makes it possible to charge admission fees for games; ordinarily, attendance is free to plant employees and to public.

Non-Sports Activities Not Forgotten—*Curtiss-Wright*

An all-season sports program comprises the bulk of the Curtiss-Wright Corporation's recreation activities for employees at the Buffalo plants. A governing body of seven men arranges a year-round schedule of indoor and outdoor events, including all major sports except football and tennis. Football is left out because of the risk of injury, while transportation difficulties have forced the abandonment of plans for net play.

Once a sport is sponsored for individual or interdepartmental competition, it falls under the direction of a full-time sports coordinator. It is his task to draft schedules and arrange all events and tournaments. Net outcome is an enrollment of 4717 men and women. The present sports chart with number of participants over a recent 12-month period reads: Badminton, 57; baseball, 45; basketball, 507; bicycle racing, 22; bowling, 2102; checkers, 26; chess, 29; general conditioning, 31; golf, 276; hockey, 18; horseshoes, 59; ice skating, 91; riflery, 57; soccer, 20; softball, 885; table tennis, 40; track, 145; volleyball, 122.

Badminton, basketball, bowling, golf, ice skating, softball, swimming, table tennis, and volleyball competition is provided for both men and women, and most of the sponsored sports are available to both day shift and night shift workers.

Employees are used as officials at games, and their assignments are handled by the sports coordinator. An umpire or referee gets $1.50 or $2, plus travel expenses. Friendships between players and officials do not influence decisions; there have been few incidents or protests.

Non-sports activities are under the supervision of a special committee of eight members—three from the factory management staff, one from the personnel department, three from the department of public and internal relations, and one secretary.

The following have been developed under the committee's guidance:

1. *Curtiss-Wright Players.* This group has a membership of 378—20 percent office, 80 percent factory personnel—and during the past year produced a three-act comedy, furnished talent for two radio programs, presented three vaudeville shows, produced a two-hour variety show in conjunction with the "True or False" radio program, sponsored a dance for first and second shift workers with a floor show as entertainment, provided music and entertainment for a USO dance, supplied talent for entertainment at departmental social affairs.

2. *Military bands.* Three bands with a total membership of 110 give concerts in cafeterias and lunch areas, have provided music on eighteen occasions during the past year.

3. *Model club.* This club is affiliated with the "Academy of Model Aeronautics" and meets monthly. Films are shown, work is compared, and new models are considered. An official contest is held annually. Models are displayed in the cafeterias. The club has demonstrated that the average employee learns much about planes by designing and constructing them in miniature.

4. *Fledgling flying club.* For girls interested in flying, this group has 25 ardent members—30 percent from office, 70 percent from factory. It meets six times a month. Flight instruction is part of the activity.

5. *Miscellaneous functions.* The committee also guides independently organized groups, clubs, and affairs. Under its guidance the activities of three excellent popular dance orchestras have been coordinated and made available not only for departmental functions but also for affairs sponsored by outside organizations. Several members of these orchestras have been with big-name bands.

Plank No. 3 in Health and Safety Platform for 1944

☆ Best Possible Medical Service

IT WAS POINTED OUT in FACTORY'S Third National Production Issue (August, 1943)—and it bears repeating as we enter our third year of war—that the job of war production, generally speaking, is being done by the weaker side of the population—the old men, women, and younger men who could not meet the physical requirements of the armed services.

Even in normal times a greater incidence of disabilities could be expected within this group. In addition, it is working at a faster pace and for longer hours than American workers are asked to work in peacetime. Moreover, medical services for civilians have been badly disrupted.

All this means that industrial plants must continue to offer the same medical care they have heretofore made available—and improve it wherever possible. Above all, it should be carried beyond the first aid station and into the physical environment of the workers.

The examples that follow serve to outline the more comprehensive approach adopted by representative industrial concerns. Programs are not described in detail; emphasis is rather upon highlighting certain aspects that may indicate current trends.

Check-Up Exams for All Workers—*Walter Kidde*

Every prospective employee of Walter Kidde & Company, Inc., receives a complete physical examination before acceptance. Major defects cause rejection, but minor or remediable ones do not. If a worker needs medical or dental care beyond his immediate means, the company refers him to a competent doctor or dentist whose charges are not too high, and arranges a budget plan of convenient weekly deductions from his wages.

Regular physical examinations at three-month intervals are reserved for workers coming in contact with potentially harmful substances, but all employees receive check-up examinations from time to time, and are given advice and help on health questions whenever they seek it.

At an indoctrination lecture, which initiates every employee's connection with the company, a nurse talks about good nutrition and hands out a booklet on proper meals for war workers. The plant cafeterias are organized on a sound basis of good nutritional principles, and well-balanced meals are always available at low cost. Candy dispensing machines are distributed throughout the plants, but if an employee is seen to be patronizing them too enthusiastically, the nurse sends for him and talks about the harmful aspects of overindulgence in sweets.

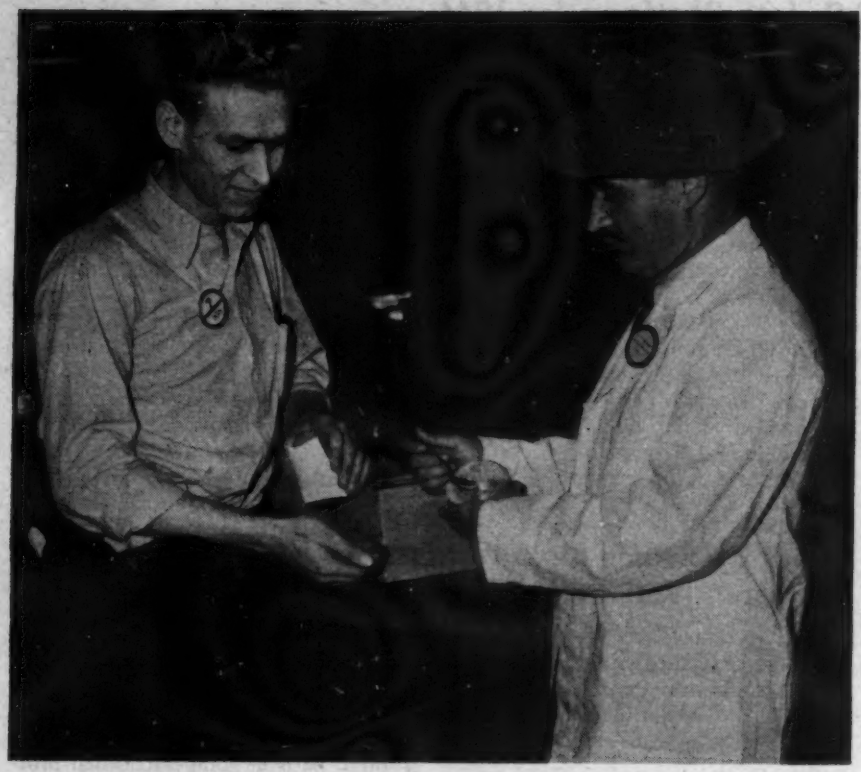
The company maintains a well-staffed and well-equipped medical department with examination and treatment rooms. Employees are encouraged to consult the staff for all injuries and minor ills. When they do so they are examined and treated, and, if necessary, sent home with advice on how to get well as quickly as possible. Vitamin pills are advised, and are sold to employees at cost. Inoculations against colds are given without charge to any worker who wants them. There has been wholehearted cooperation from Kidde employees and a resultant reduction in absenteeism from this cause.

Inoculations against colds are free at Walter Kidde & Company, which believes this practice has helped fight on absenteeism

Vitamin Tablets Sold at Cost—*Bausch & Lomb*

Further light on the vitamin question is shed by a recent statement made by the medical director of Bausch & Lomb, Rochester, to all employees. It reads as follows:

"It has become increasingly difficult during the past several months to obtain the required meat and vegetables. More often than not, you are forced to substitute another food. If



Vitamin ration is served to Lockheed employee at the job

the substitute didn't appeal to you, you probably went without it. This may have resulted in your not getting the proper amount of vitamins.

"In order that you may maintain top physical and mental alertness despite the changing food problem, we are making available to our workers at cost a vitamin tablet which contains the minimum daily requirement of all the essential vitamins. The tablets are now on sale in the restaurant commissaries at all our plants.

"Vitamins are not a 'cure-all,' so if you are in doubt about whether you need to take them, consult the medical department."

Sun Baths Encouraged—*Woodward Governor*

Before an applicant is accepted into the membership of the Woodward Governor Company at Rockford, Ill., it is necessary for him to pass a physical examination given by company doctors. This includes a general physical check-up with urinalysis, Wassermann test, complete dental X-ray, foot examination, Mantaux test for tuberculosis and chest X-ray if necessary.

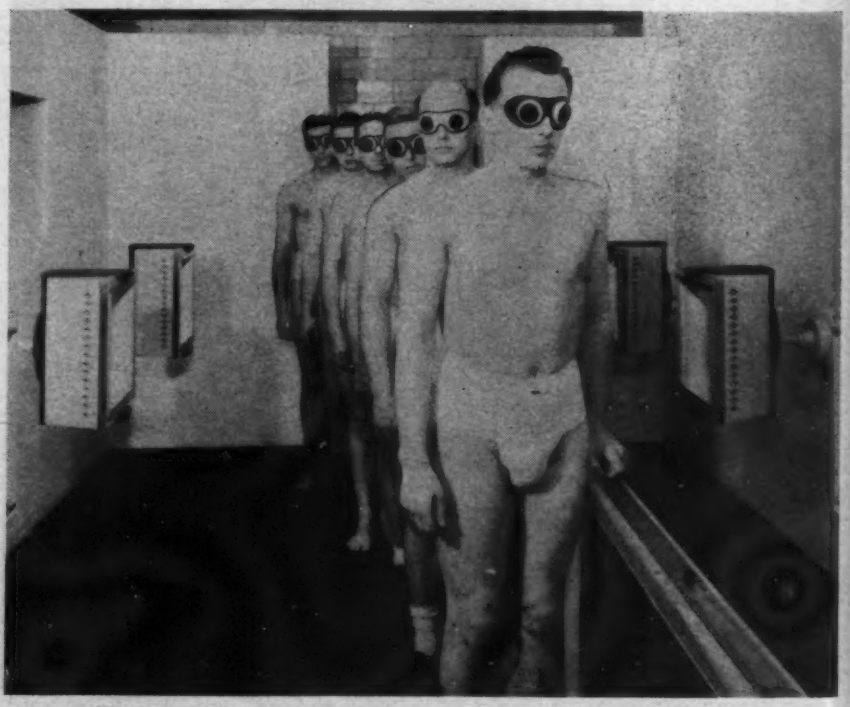
The purpose is not necessarily to select all 1-A material, but to determine whether or not a person is physically capable of doing the work for which he is being hired. For example, a girl whose eyes may not meet requirements for inspection work may be suitable for work that involves less eyestrain. The second aim is to take steps toward correcting physical defects that may have been discovered in the pre-membership examinations.

A written report of the examination is sent to the first aid department, and each member is called in for consultation with the nurse, who attempts to answer any questions he may have concerning his report. A record is made of corrections or recommendations that the doctors have made, and the member is told what steps he should take to remedy defects. He is expected to make all corrections, and report them to first aid within a reasonable time.

The first aid room is equipped and staffed to treat all minor injuries, such as cuts, bruises, abrasions, and slivers. Most of these minor injuries can be cared for and re-dressed completely in first aid. If the nurse decides that an injury needs a doctor's attention, the patient is taken to one of the dozen or so physicians recommended by the company's consulting doctor. After a patient has seen the doctor, the redressings and suture removal are done by the nurses.

Aching muscles and joints can be treated quite successfully with the short-wave diathermy machine which is in the first aid department. The machine is not used as a "cure," but simply to relieve pain.

Other equipment in the first aid department includes a porcelain foot bath for applying hot or cold treatments to lower extremities; eye, ear, nose, and throat treatment chair and



Sun baths are part of the health program at Woodward Governor plant, and employees are encouraged to take at least three a week

diagnostic lamp; treatment table for use in diathermy and massage. There is also one complete hospital unit, consisting of hospital bed, ring stand and chair for use in treating seriously injured or ill members, treatment cabinet equipped with necessary solutions and dressings, and electric sterilizer.

The Woodward clinic contains a solarium with eight ultra-violet lamps. Forty-five seconds under these lights are approximately equivalent to an hour in the sun. Although sun baths are not obligatory, members are encouraged to take at least three a week during the winter months. There is also a doctor's examining room, with a blood pressure meter and other necessary examining equipment. A dental X-ray machine, an electric steam cabinet, and an oculist's examining cubicle complete the equipment of the clinic.

Dermatitis, caused principally by necessary contact with cutting oils and coolants, has been effectively checked by the use of protective creams and ointments. If a worker is troubled with a skin rash, he is advised exactly what cream to use and how to use it to the best advantage. Members with rashes that do not respond to such treatment are sent to a skin specialist for special attention.

To insure the continued health of members, each employee has a yearly physical check-up, eye examination, and dental X-ray. There is a careful follow-up on all the results of these examinations, and each member is required to report on the progress of the work. For example, the dental X-rays are sent to the dentist of the member's choice along with two cards, one reporting when the work is begun and the other to be returned to the company when the work is completed.

Daily absence reports are sent by the supervisors to the first aid department. If a member is absent for more than two days, he is visited at his home by the head of the first aid department, and care is taken to see that he gets proper medical attention.

Woodward Governor feels that its health program has paid dividends in better member morale and a greatly improved absenteeism record.

Jobs Changed If Health Demands—*Westinghouse*

Workers at Westinghouse Electric & Manufacturing Company, Pittsburgh, are given a pre-employment examination which often determines on what jobs they will be placed. Periodic examinations follow. If an employee is affected adversely by his work, he is transferred to another operation. A health record is kept for each employee, and the record is augmented by home visitors who seek to correct poor eating, sleeping, and playing habits. There is a plant nutrition program, and the Health-for-Victory Club has enlisted hundreds of mothers and wives in a campaign to achieve dietary perfection in home meals.

But feeding is only part of the job. Once a year large numbers of employees are given a thorough physical check-up, to determine how they have reacted to the conditions of their employment. Welders, spray painters, foundrymen, sandblasters, cranemen, and a dozen other specialists must undergo the examination. If the check-up discloses that the worker has been affected in any way by exposure to the hazards of his occupation, or no longer measures up to the physical standards of his job, he is immediately transferred to another position.

For example, a craneman with high blood pressure would be a definite hazard to other employees. By yearly examination, Westinghouse is able to keep a steady finger on the health pulse of employees and eliminate many dangerous human conditions.

Often the examinations will disclose the beginning of an illness or disease of which the worker is entirely unaware. One husky worker recently reported for his annual examination—and the X-ray revealed the beginnings of tuberculosis. He was told to see his family physician at once, and three weeks later went to a state sanitorium. This worker was employed as a painter; if he had not been examined, the disease would soon have reached

Samples of all new materials used at Westinghouse plants are carefully tested in the company's industrial hygiene laboratory for properties that may possibly be harmful to employees in war work

the acutely dangerous stage. Now he is well on the road to recovery, and will soon be back on the job—a different job, of course.

The plant industrial hygiene laboratory keeps a card index of all the thousands of materials used in a war plant —and in the case of Westinghouse this has grown to 9000 different items since the war began. Before any new material is put into use, it is first sent to the laboratory to be checked. If it is found toxic or otherwise harmful, the information is passed on to shop supervisors and workers, and the necessary protective measures are instituted.

Waging War on Syphilis—*Caterpillar Tractor*

Because it realizes that every hour lost through illness is an hour gained for our enemies, Caterpillar Tractor Company, Peoria, Ill., is waging a good fight to keep its employees healthy and on the job.

For many years the company has manifested its interest in industrial health by setting up well-equipped first aid stations and establishing efficient safety and health programs. Those in charge of man-hour conservation have kept step with the times, too, by expanding the scope of their activities as employment has increased to approximately 17,000 persons.

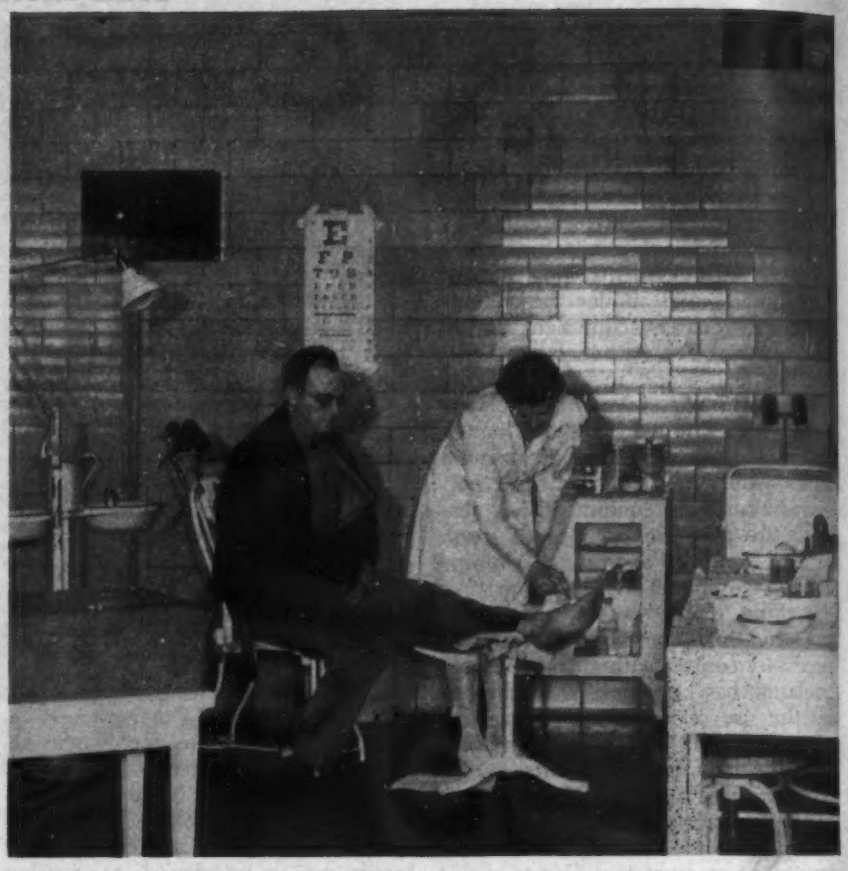
The pre-employment examination consists of a complete physical check-up which includes visual tests, blood samples, and urinalysis, thereby revealing the applicant's physical condition and preventing his being placed on a job where he might endanger himself or others. Rejections, totaling less than 1 percent, are made only when the applicant is suffering from contagious diseases, marked high blood pressure, tuberculosis, serious heart disease, or impairment of sight.

Later examinations are made periodically and on request of the employee or his supervisor.

By cooperating with the U. S. Public Health syphilis control program, Caterpillar has helped industry's fight against the "great killer." The company maintains its own laboratory, fully equipped for blood and urinalysis, blood cultures, and chemical analysis to prevent and diagnose occupational diseases. A trained technician is in charge to make these tests and provide emergency treatment.

The physio-therapy department is fully equipped with infra-red, diathermy, and ultra-violet, and injured employees are given massage by a trained physio-therapist.

A constant check is made by the safety and medical department for chemical and dust hazards, so the employee's health will be constantly safeguarded.



Bullard has two large and well-equipped first aid stations, and maintains working agreements with 42 doctors in a radius of 50 miles

Five first aid stations are conveniently located throughout the plant and are constantly supervised by graduate registered nurses. Both health and accident problems are discussed in the employees' magazines in articles prepared by the medical department.

Medical records are considered confidential and are available only to the physicians in charge. Results of physical examinations are not given to supervisors or other department heads, because it is desired to give the employee the same consideration he would normally receive from his personal physician.

Emergency treatment is rendered by the medical department in case of illness, but the individual is advised to consult his family physician whenever possible. In many cases the latter is called and informed of the employee's condition so that the medical department's findings may aid in the correction of the illness.

In addition, the medical division has cooperated with other industries in the vicinity to bring the wives of employees instruction and advice on nutrition problems. Nationally known experts conducted programs, nutrition booklets were given away, and a special nutrition supplement prepared by the medical division was given to every Caterpillar employee.

Working Agreement With Many Doctors—*Bullard*

Forty-two doctors located within a radius of 50 miles help The Bullard Company, Bridgeport, Conn., keep a close check upon the health of its more than 5000 employees.

These doctors, located as far as New York City, beyond Danbury, and east of Branford, Conn., watch the health of Bullard employees who have been reported ill to them. In addition, the company operates two first aid rooms and a complete medical center; employs nine registered nurses, two trained attendants, and two clerks; and keeps three doctors always on 24-hour call.

The Bullard Company gives all employees a pre-employment physical examination, but the work does not stop there. Physical check-ups and medical advice are made freely available to both men and women workers.

Plank No. 4 in the Health and Safety Platform for 1944

☆ Freedom From Fear of Accident

IF MANAGEMENT has learned one thing over the years about safety, it is that in education lies its best hope of combating the hazards of plant operation.

Safety education, management has found, begins at the very moment of hiring—and never ends. Its purpose is to get employees to *think* safety. One company, whose program is described on page 114, even has trainees of a few days' standing teach safety to the newest trainees on the job. Of course, it is the "teachers" who benefit most, and that was exactly what the company had in mind when it initiated the unusual practice.

Another good way to teach safety—and a way that any concern can use—is to see to it that a large number of workers serve, over a period of time, on plant safety committees. A man with this experience is usually bitten by the "safety bug" and fortunately seldom recovers.

It is the broad educational approach, indeed, that has been chosen by the five plants whose safety programs are outlined in the case material that immediately follows. The solutions these plants have found are recipes any plant can use—which is precisely why they are set down here.

Working Closely With Schools—*Bigelow-Sanford*

Every effort is made at Bigelow-Sanford Carpet Company, Inc., Thompsonville, Conn., to make every employee take an active part and a continuing interest in safety. The safety program is headed by a safety committee composed of members from both management and labor. Each department also has its own safety committee. All safety equipment and working methods which might be considered unsafe, as well as good housekeeping methods, are studied by the department safety committees, and prompt reports are submitted to the safety inspector, who then makes the necessary recommendations.

Because this company is the largest in the community, it has been found helpful to work closely with the schools, so that the idea of safety in the plant, at home, or on streets is brought to future employees. From time to time the company awards cash prizes for the best essays on safety. The school safety patrol is invited to the plant and conducted through every department, where the children can observe actual working conditions and the safeguarding of machines, and thus gain a knowledge of what safety means in an industrial plant.

Safety plate of 1-in. hardwood backed by a piece of ⅜-in. steel was designed at Lockheed to protect the operator of a high-speed, single-head, revolving shaper from possible injury caused by a blade coming loose and flying at the speed of a bullet into the groin

New Safety Record for the West Coast—*Lockheed*

Said to be a new safety record for industry on the Pacific Coast, 1500 employees of the experimental and central mock-up department of the Lockheed Corporation have worked 1,275,000 consecutive man-hours without a single lost-time accident.

Such things do not just happen. Enviable records are the result of careful planning, hard work, and cooperation on the part of everyone.

The department is now striving to reach a new goal of 2,500,000 man-hours without an industrial accident. Their progress is charted on a huge map of the Pacific, on which a ship representing Department 124 makes a 2,500,000 man-hour trip from Los Angeles to Port Moresby. The ship is now on its homeward journey, just off the northeast tip of New Guinea.

Last February employees of this department decided that industrial injuries were needless, and that they occurred only when someone did something wrong. With this in mind, they embarked upon their safety program, giving special attention to proper instructions to employees. Continued attention was given to plant housekeeping and to personal protective equipment, such as goggles and respirators. Guards on machinery, also rails and toeboards on elevated platforms and stairways, were checked to make sure they were adequate.

The workers knew the department would operate more efficiently if accidents were eliminated. The spirit

caught on, and soon they were all operating as a team. As a consequence, they worked for a period of approximately three months without a lost-time injury, building up more than 864,000 lost-time-free employee hours. Then came a strained back, along toward the latter part of May. Another lost-time injury occurred on June 1, when some sheet metal tipped over. This was naturally somewhat discouraging after such a fine start. However, they cinched up their belts and started over again from scratch.

More emphasis was given to safety and the large map which indicated how they were progressing was placed directly over the time clock. They set their sights on a million employee hours. The rest of June went by; then July, August, and September. They were getting close. By the middle of October they had reached their goal. An announcement of their accomplishment was made to all employees over the public address system. Congratulations were in order. Pain and misery had been eliminated; production had been stepped up; everyone felt good.

They knew a busy experimental department, which included practically all operations performed in a modern combat airplane manufacturing company, could work efficiently without injuries—and they proved it.

"Be Extra Careful" says Lockheed sign. The operator is doubly protected. Cutoff saw wears a guard—and he wears a safety mask

Safety Role of Foreman Stressed—*General Motors*

The safety program in plants of General Motors Corporation is based on a six-point plan established by C. E. Wilson, president:

1. Interest in safety on the part of top management.

2. A definitely established safety organization through the supervisory organization to each employee.

3. Adequate and capable full-time safety personnel.

4. Written safety procedure and instructions for each occupation.

5. Thorough safety instruction of new employees.

6. Stimulation of interest on the part of every employee.

Much emphasis is placed on the part played by the supervisory force, definite safety duties of foremen and assistant foremen have been set down:

1. To understand fully the general safety policies of the division.

2. To be responsible for safety guards and safety devices in their departments; to write out all orders for safety guards and appliances; to follow up and see that the guards are installed; to consider that the supervision of safety in their own departments is one of their major responsibilities.

3. To talk to at least two of his employees every working day on the subject of safety. The time spent with each employee should not be less than 5 minutes. Therefore, every foreman and assistant foreman will spend at least 10 minutes every working day in giving safety instructions to individual operators. A record of these individual talks shall be kept in the department on cards provided by the safety director. The method of recording their talks will be set up by the safety director. The most important part of the entire safety program, so far as the foremen and assistant foremen are concerned, is the regular day-to-day discussion of safety with individual operators on the manufacturing floor.

4. To promote safety by attention to safety posters, special safety movies, etc., as opportunity affords. It is not intended that the safety program shall center particularly around safety posters, safety movies, etc. These are only incidental, it being understood that the most effective means of promoting safety is by consultation with individual operators.

5. To instruct new operators in safety. This is in addition to the instructions to new operators by the safety director, prior to reporting to the department for work. In particular, to instruct all new employees as to proper operation of equipment on his job.

6. To instruct all old operators transferred to the department as to the proper operation of equipment on the job.

7. To recognize that safety is as truly a part of the job as production, schedules, labor relations, etc. A good foreman or assistant foreman works daily on safety problems the same as on production problems.

Trainees Taught Safety by Trainees—*Westinghouse*

There is no better way to learn than to teach. This creed served as the basis for safety instruction to new workers—many of whom had no prior industrial experience—in an ordnance plant operated by Westinghouse Electric & Manufacturing Company.

Safety lesson begins when the employee is hired. Safety shoes and goggles are fitted during the employment procedure. Safety instruction booklets are given for study.

Each shift is arranged so that one-

No danger of sprained backs when the safety hoist is used. This job was once done at Lockheed by manpower with the aid of prying bars

third of the trainees are new employees. The other two-thirds are encouraged to teach safety rules to the newest members of the classes.

Ten percent of the newest trainees are placed on the safety committee of each shift. Regular weekly meetings are held to make recommendations for eliminating safety hazards. Each trainee is requested to watch for safety rule infractions on the part of his neighbor. Particular attention is paid to workers' clothing. Because of this constant emphasis, trainees taking their places in regular production are as fully trained in safety as in their trades.

Safety is a major point at the ordnance plant, and the safety organization is credited with the low accident frequency ratio maintained. The organization is divided into the following groups:

1. A plant safety committee, headed by the plant manager and including superintendents and supervisors. At monthly meetings of this group, plantwide safety measures are considered.

2. A supervisory safety committee comprised of superintendents and foremen. It meets regularly to consider divisional safety problems.

3. A general safety committee composed of outstanding safety workers. Two men from each building are on this committee, which inspects the plant monthly and makes plantwide recommendations. Members are appointed for one year by the plant manager. The plant safety supervisor acts as secretary of this general safety committee's meetings.

4. A safety committee in each building. This committee consists of one man from each department of 35 men or less. When there are many more, one man for each 35 is selected. Members are chosen to represent all trades, including trainees. Foremen and assistant foremen rotate as chairmen of these committees, each man acting for three months. Each committee inspects its building once a month, and holds its meeting a few days later. Recommendations are made on a prepared form and incorporated in the minutes of the meeting. These minutes are passed on to the plant and supervisory committees, who grant permission to the committee to carry out recommendations.

5. Each shift has a safety committee as outlined above.

6. Motor and electric truck drivers on each shift have organized safety committees. They make recommendations regarding traffic regulations and the safe operation of materials handling equipment.

Disfavor of Their Fellows Feared—*Walter Kidde*

Precautions for the safety of the workers in plants of Walter Kidde & Company begin with their employment. At the indoctrination lecture which initiates their connection with the company, they witness a film on safety and receive a rule book. Safety rules are outlined, and the reasons for them explained.

Safety garments are required, and the company arranges a budget plan for their purchase if desired. A labor safety committee which includes one or two men from each department plays an active part in encouraging constant observation of safety rules. A worker who is careless finds himself in disfavor with his fellows. This has a much more compelling effect than criticism by his superiors.

Painters, sprayers, and platers are given physical examinations every three months, and supplied with dicalcium phosphate to combat possible lead absorption. Employees handling crates or other objects coming in contact with the ground are given antitetanus injections.

General safety devices in the plants include two-hand controls and a photocell on the hydraulic presses, which causes the machine to stop when the beam is interrupted. Special devices have been developed for particular hazards. One is a guard on the wire-winding machines used in shatterproofing oxygen cylinders. A breaking wire might whip out from the winder and into the face of the operator. The guard tends to prevent this, and also actuates a braking mechanism which shuts off the power and rapidly slows the machine.

"Our Best Safety Idea for 1943"

Case Material From 15 Representative Companies

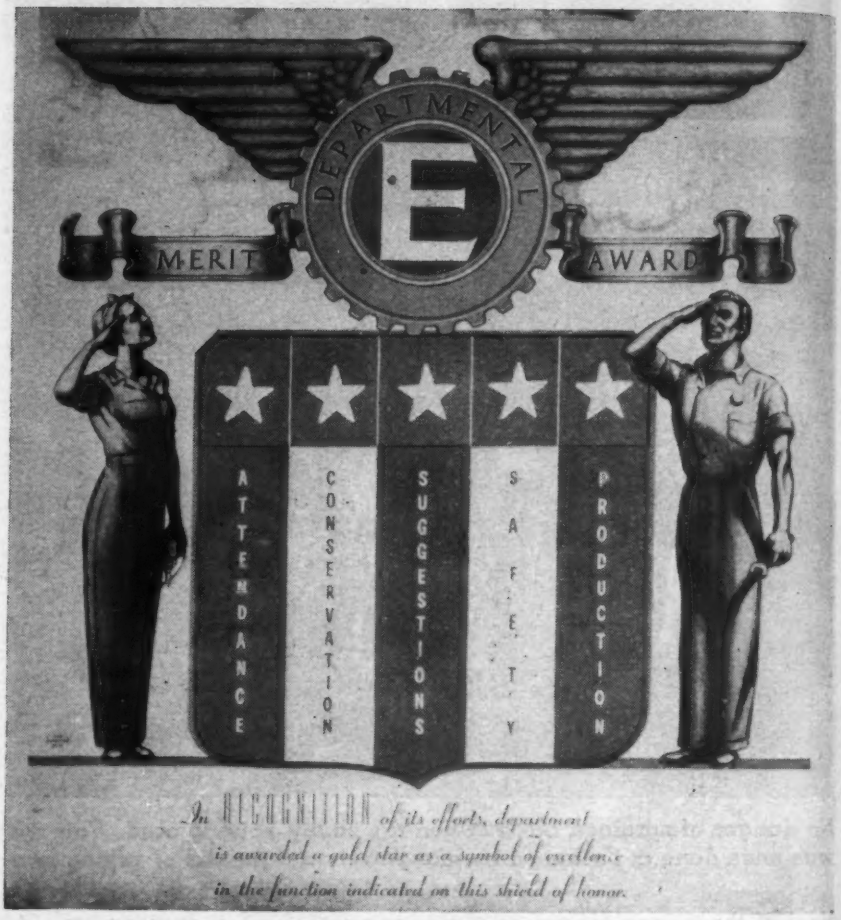
Departmental "E" Awards for Safety Achievement

Outstanding in Douglas Aircraft's 1943 safety accomplishments is a "Departmental E" program embodying safety, production, conservation, suggestions, and absenteeism. The program is under the direction of the labor-management production drive committee.

Standards are established, and a plaque with a 5-striped shield and a white "E" at the crest is given to each department. A monthly review of departments is made and those meeting all requirements receive five gold stars and a gold "E" to affix to the plaque. Employees of departments winning gold "E's" get a ribbon signifying the achievement. Departments failing to qualify in all five points receive gold stars only for those in which standards have been maintained.

Once a gold star or "E" is won, departments must maintain the standards to qualify for the award in subsequent months. Different colored ribbons are issued each month.

Responsibility for enforcement of the standards has been placed squarely on the shoulders of the supervisors. If they want to keep the gold star safety award, they must meet the standards. All departments that fail to get awards are notified why the star has been withheld. This program has done more to make supervision realize that safety is their responsibility than any other program we have ever devised. Its value is reflected not only in lower accident rates, but also in better shop and working conditions. —*William S. Rhodes, Chief Safety Engineer, Douglas Aircraft Company, Inc., Santa Monica, Calif.*



Douglas Aircraft awards "E's" with gold stars to plant departments whose safety accomplishments meet carefully set standards

Monthly Inspection Tour and Slogan Contest

Better housekeeping and more consciousness of the importance of safety have resulted from two methods that have been inaugurated in our plant during the last year.

First was the good housekeeping inspection committee. We divided our plant properties into three areas—A, B, and C. Our interplant safety committee, which is made up of representatives of each foreman's department, appointed a committee of nine to make monthly housekeeping inspection trips through these areas, three men to an area. The committee serves for six months, and the three men assigned to an area continue their inspection of that area, so that they can determine whether or not an improvement has been made.

Of the three men appointed to an area, one is from area A, one from B, and one from C, to eliminate any prejudice in the ratings.

During the monthly inspection, each of the inspectors has a report form, and each individually gives the department, room, or floor subdivision an individual rating. At the end of the trip, these individual ratings are averaged to determine the final rating.

Copies of the combined inspection report are sent to the plant manager and the superintendents of the areas, and one copy is posted on the bulletin board in each general department, for all employees to see.

The second method of promoting safety is a safety slogan contest, inaugurated to stimulate interest in safety generally, and to collect safety slogans to be used in posters.

Each contest runs for a month. An entry blank with a numbered stub is used, the entry blank being turned in to the department safety committeeman and the stub kept until the contest committee chooses the best slogan for the month.

The number of the winning slogan is posted on bulletin boards, and the

contestant holding the corresponding stub is invited to attend the next monthly safety meeting and is presented with a $5 award. The winning slogan is used as the safety slogan for the month, and posted on all safety bulletin boards, with the name of the person submitting it. At the end of the year the best slogan will be selected and a grand prize of $10 given. *—Roland W. Richardson, The Gardner-Richardson Company, Middletown, Ohio.*

Committee of 10 Percent of All Employees

An analysis of our safety records at the end of 1940 indicated that we needed to improve. All our machines were well guarded, so that it was necessary to work from some other angle. We made a study of all accidents reported to our works' hospital for one month, interviewed every person reporting, and asked, "How did it happen?" and "What can we do to prevent a repetition?" We found that 96.4 percent of all who reported stated that they were sorry, but they had not been sufficiently careful.

We decided, therefore, that it was necessary to make the individual more safety-minded.

Starting in February, 1941, a works safety committee was appointed, consisting of 10 percent of all the employees in the plant, both men and women. This committee was broken down into groups of from 25 to 100, each group representing one division in the plant. The foreman of each department was asked to appoint the members of the committee from his department.

The committee meets once each month for one hour, on company time. We point out any outstanding accidents that have occurred during the month, and discuss them from the angle of educating those present. Then the members of the committee bring up any matters they know of which would improve conditions in the plant and eliminate accidents. The last ten minutes of the meeting are devoted to a lecture on the fundamentals of first aid.

Each committee functions for six months. Then a new one is formed, and the whole procedure starts over again. Since the inception of the plan, our accident frequency rate has taken a decided drop, and the Pittsfield Works curve is substantially below the heavy machine shop average. *—J. E. Mercure, General Electric Company, Pittsfield, Mass.*

Phototube Protection for Worker's Fingers

On a press used for forming the leads of radio tube stems at the Harrison, N. J., plant of RCA Victor Division of Radio Corporation of America, worker's fingers are guarded against all possibility of accidents by the positive action of electron tubes which provide an invisible guard rail between dies and fingers.

By means of the two mirrors shown at either side in front of the press (see illustration), a beam of light is reflected across the front of the press close to the dies and back to a phototube in the control unit. Should the worker accidentally extend her fingers into the press, interruption of the light beam locks the mechanism with the dies open. Foolproof even in event of breakdown, the device is so constructed that the failure of any tube, light, or part will cause the unit to lock in the "off" position. The entire mechanism, except for the two small mirrors, is contained in a compact cabinet behind the press.

Accidents can't happen here, says RCA Victor. Reason is phototube control which stops press if fingers stray where they shouldn't

Way to Safety Shown by Two Accidents

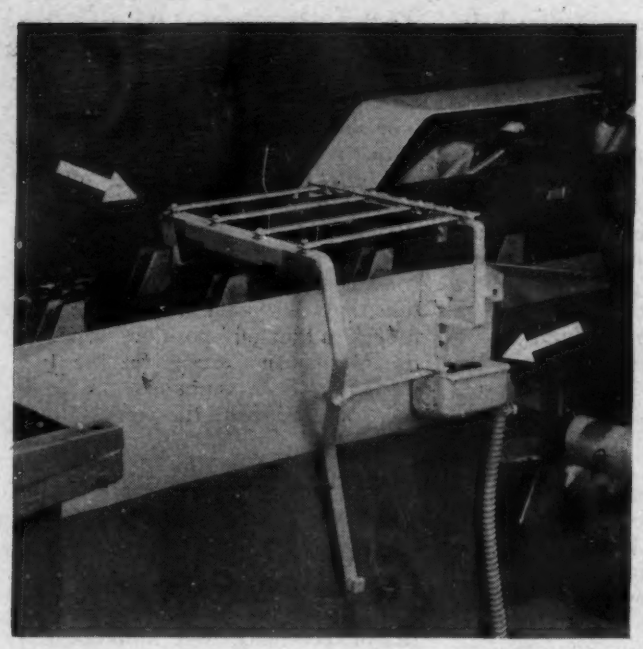
Two accidents showed us the way to better safety practices and caused us to make changes so that possibilities of recurrence were minimized.

Two millwrights were using an electric drill to drill an overhead beam. They were working on a ladder. The man controlling the drill kept it in motion by holding the trigger down. However, without realizing that he had done so, he had pushed the button that locks the trigger down and keeps the drill in operation. When the drill went through the beam, the operator released the trigger and relaxed his hold on the drill, preparatory to pulling it out of the beam. Because the drill trigger was locked down, the drill continued to operate, and when the operator's hold was relaxed the drill spun around, the handle striking him on the forehead. His partner saved him from a fall.

To prevent repetition of this type of accident, the lock buttons were removed from all our electric drills of all sizes. There have been no similar accidents since.

Two of our machines, still in the development stage, are operated by an operator and three assistants. Because the machines were still being improved. they had to be stopped frequently, and the operator and helpers often reached into them to make adjustments and to line up the material. It was standard practice and a rule for the person starting the machine to call a warning to the others before pressing the starting button. One of the assistants was slightly injured on several occasions when the warning was not heard—or heeded.

The wiring systems of the two machines were changed so that the machines can be stopped from any of the four positions normally occupied by the operator and his helpers. They can be started, however, only from



Guard on Beech-Nut mint wrapping machine prevents operator from getting hand or finger caught

Truck handles at Beech-Nut were extended so that the trucker's feet are always in the clear

the operator's button. When this button is pressed an electric horn sounds, a 3-sec. wait follows, and then machine starts. Nearly a year has passed since we have had an injury on these machines.—*H. H. Aderhold, Safety Director, Marathon Paper Mills Company, Menasha, Wis.*

Leatherette for Bronze in Safety Trophies

We believe that our trophies are an integral part of our safety program. And the fact that our plants, in 15 years, have won a total of 141 trophies for operating a year without a disabling injury, would seem to verify this opinion.

When Uncle Sam said "no" to the use of bronze in safety trophies, we were faced with the problem of finding a reasonably good imitation or going to a paper certificate. We decided, therefore, to work up the best imitation possible to keep our trophy program intact during the war period.

The wartime trophies we now use are exactly the same size and design as the original bronze ones. The surface is brown leatherette on heavy binder's board. The letters are gold-stamped into this surface, and the checker board (our trademark) border is hand-brushed.

Trophies are of two types. One, a rectangular plate mounted on a walnut base, is awarded to a plant when it completes a year without a disabling injury. When this plant repeats, a bronze bar is added below the trophy. Many of our plants now have eight, nine, and ten bars on their trophies.

The other, a "checkerboard bag" trophy, is awarded to the winner in each of our three groups in the annual safety contest. When a plant wins one of these trophies a second time, a large base is used, and a tablet is added below the original trophy.

Although we are not ashamed of our wartime safety awards, we do plan to replace them with more permanent bronze castings as soon as the war is over. In the meantime, we feel that these imitations are far more attractive and have a better appeal to our employees than mere paper certificates would have.—*George H. Steel, Safety Director, Ralston Purina Company, St. Louis.*

Supervisors Schooled in Safety Measures

The up-to-date safety program is selling the employees, not management, on safety. The management has been sold for quite some time. Our job, as safety men, is getting safety down so that it reaches the individual. This is done by educating superintendents, foremen, and their assistants in the fundamentals of safety.

There are several courses available, and one of the outstanding ones is the 20-hour safety course sponsored by the National Safety Council and the U. S. Department of Labor.

We have three classes. The first is composed of superintendents and top management. The second and third classes are made up of foremen and assistant foremen. These classes are held once a week and they last from 1½ to 2 hours, depending upon the subject and the discussion.

We insist that safety is part of each supervisor's job. He must turn out safe work because, if the job is not done safely, it is not done efficiently. The supervisors are constantly in touch with their workers and by checking the unsafe acts, they are able to stop accidents before they happen. The bull's eye in accident prevention is eliminating the unsafe acts, physical or mechanical.

Guarding machines and equipment to the fullest extent is very important. A guard that is well designed increases production. There is not a machine today that cannot be properly guarded. In one of the two accompanying photographs, a mechanical guard is shown on mint wrapping machines which shuts off the power at once if an operator's hand comes within the danger zone. A similar mechanical guard on the box end sealer stops the machine at once if an operator's hand comes within the danger zone.

The other photograph shows hand trucks before and after we extended the handle forward to keep the trucker's feet in the clear when pulling this type of truck; the simple change makes this kind of accident impossible. Another change we made was to install a cable inside of a coil spring on over-

head doors to keep the spring from flying, in case it broke. Once one did break and fly, and just missed causing a serious accident—*W. J. Wright, Plant Safety Supervisor, Beech-Nut Packing Company, Canajoharie, N. Y.*

Tangible Results Secured From Safety Booklet

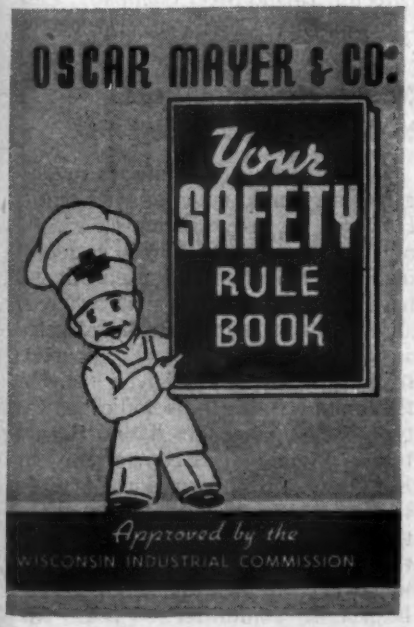
Following the President's proclamation of August 18, 1941, in which he called attention to the appalling loss of life through accidents, we issued a little book called "I Make My Own Record." This was distributed to all old employees and is given to all new people entering our employ, together with a copy of the President's message and a special message from our production manager.

Although it is hard in safety work to put your finger on something and say "this turned the trick," we do believe that distribution of this booklet has contributed to a reduction of 16 percent in accident frequency made during the past twelve months.—*W. B. Weaver, Marshall Field & Company, Spray, N. C.*

Safety Rules Tailored to Fit the Plant

"Accident prevention is up to one person—that person is YOU." "Accident's don't always happen to the other fellow." "Many injuries are caused by sending the body out to work and the mind out to play." Little slogans like these are found at the bottom of every page of "Your Safety Rule Book," the booklet given to each new employee in our plant. Safety rules tailored to fit our special operating conditions, and the reasons for the rules are clearly expressed in language that allows no misintepretation.

A safety demonstration and talk in the induction program for each new employee help to start the worker on the right safety track. How much the company is concerned in having each employee learn the correct and safe way of doing his job, and in having each employee form good, safe working habits is stressed. This part of the induction program, together with the booklet, helps to keep our accident record low.—*H. T. Jaeke, Operations Manager, Oscar Mayer & Company, Madison, Wis.*



Oscar Mayer's safety rule book is brief and much to the point

Booklet distributed by Marshall Field is credited with playing major role in reducing accident frequency 16 percent during the past year

Education the One Best Safety Idea

I believe that our best safety idea of 1943 is the same as it has been for the last 30 years—education in safety.

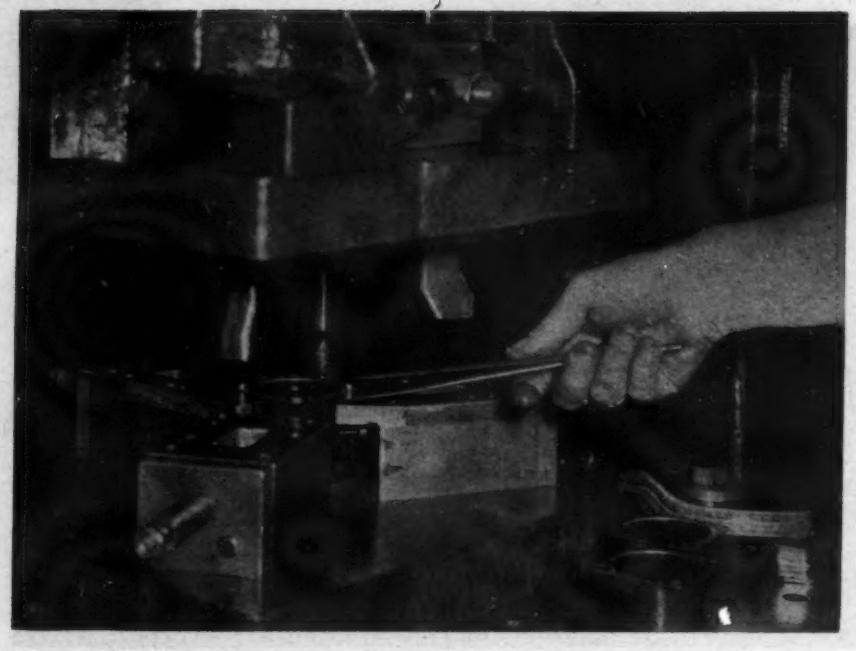
We are facing problems today that we never dreamed of prior to the war, and these problems must be met and solved just as quickly as they come to our attention. However, an efficient safety department, a good fire control program, fume and dust control, good sanitation and housekeeping, good lighting, safety guards of all types and designs, personal safety equipment, machine and press control switches, posters, safety contests, rules, instructions, education, suggestion plans, plant publications, meetings, moving pictures and slides, competent medical and first aid facilities, and periodic examinations for employees, all play their parts in any safety program. In our case we feel the over-all program is responsible for our results, and not any one single activity.—*E. A. Ellis, Director, Welfare and Safety, Wheeling Steel Corporation, Wheeling, W. Va.*

Shop Group Meetings for Safety Suggestions

Most of the safety ideas in our plant are brought out at shop group meetings, held on company time once a week from 12:30 to 1 p. m. These groups are made up of representatives from each shop department, selected from a list of names from each department. Names are rotated each week, so that each person in the plant has an opportunity to take frequent part in the meetings.

No operating supervisors attend the meetings. All safety ideas and suggestions are first submitted to the supervisors concerned. Those that are not acted upon are reported at the group meetings.

The safety engineer acts as the chairman and secretary of these group meetings. Besides bringing out safety ideas, the safety engineer encourages members of the group to "blow off steam" about any grievances they may



At Westinghouse, if a part is too big to be blown out of die, extra long tweezers are used to keep operators' hands out of danger zone

have against the company, supervisors, or anything else.

All the ideas are numbered and dated. No names are mentioned, and employees can make suggestions concerning their own or any of the other departments.

The success of this system depends on the follow-up. The safety engineer checks each suggestion, follows it through to top management, gets all assistance possible, and at the next meeting reports his success.—*A. D. Hess, Safety Engineer, Whiting Corporation, Harvey, Ill.*

Safety Contest Found to Work Effectively

For some time we have been concerned with the number of accidents we were experiencing and their severity. In an effort to retard this trend, we finally decided to conduct a safety contest.

The plant was divided in ten units, each with about 120 employees. All units started with a credit of 100 points, as of August 1. A lost-time accident results in a charge of 2 points for each day lost. In this way some recognition is given to the severity of accidents, without making the charge so great that the severity is overemphasized.

The contest runs for five months, with prizes as follows: First prize $100, second, $50; third, $25. In case there are several units with perfect records, each unit is paid $100. A committee from the winning units is appointed to determine how the prize money is to be shared.—*L. C. Smith, Personnel Director, Thilmany Pulp & Paper Company, Kaukauna, Wis.*

Full-Time Director Found to Be a Big Help

Appointment of a full-time safety director, with a knowledge of all plant operations and a discerning eye for possible hazards, has, we believe, been our outstanding safety idea for 1943.

The direction of our safety program had always been a side issue of our employment office. An enthusiastic and interested supervisory staff built up a modern first aid room, with qualified nurses on each shift. Occasional plant inspections were made. Safety magazines were routed to all supervisors and foremen and an excellent poster service kept the movement in the eyes of all employees. Results were good, and were progressively better year after year until recently.

Then, with the influx of incapacitated workers, women with no previous factory experience, job conversion, and so on, frequency and severity of accidents increased.

The appointment of the safety director soon produced noticeable results. Records were analyzed. Foremen who had the highest turnover soon found that, coincidentally, they also had the greatest number of minor injuries. Steps taken to provide proper instruction and simple safety equipment soon demonstrated that, instead of a necessary evil, the safety director was a real help.—*C. A. Hubner, Assistant to Plant Manager, American Hard Rubber Company, Butler, N. J.*

Turkeys Given as Prizes in Safety Contests

It has been our experience over a period of years that the "holiday season," by which I mean the months of November, December, and January, have always had the highest accident severity rate for the year.

In order to combat this increase during the current 1943-44 season, we have therefore conducted an "Unsafe Practice Turkey Contest."

To qualify for the November contest, a workman had to jot down one unsafe practice he had observed in the plant, giving only the date and department number, not the name of the person. As a result, we soon discovered that the men were not only observing the unsafe practices of their fellow-workers, but were also being more alert on their own jobs.

On November 22, the names of all employees who qualified in each department were put in a box, and the number of turkeys allotted to that department were drawn. This allotment was based, of course, on the number employed in each department.

The purpose of this contest was to create an interest on the part of our employees in reducing all types of accidents. It is also our hope to accomplish a substantial reduction in accident severity.—*J. L. Ridinger, Safety Director, Inland Steel Company, East Chicago, Ind.*

More Attention Paid to Minor Accidents

In the past we have always investigated accidents entailing lost time. However, in many other cases we did not pay enough attention to accidents involving only first aid. Recently we have inaugurated a program whereby all first aid accidents are investigated as to cause. Any employee reporting to the first aid room is given a slip by the nurse on which is indicated the type of first aid rendered, and the nature of the injury. A copy of this slip is returned to the employee's supervisor, who investigates to determine the cause. Many times a condition is then brought to our attention which might have escaped the scrutiny of the inspection committee.—*V. L. McMullen, Personnel Director, Clinton Company, Clinton, Ia.*

Tool Control That Works

C. A. SIPE, Manufacturing Engineer, Headquarters Manufacturing Engineering Department, Westinghouse Electric & Manufacturing Company, East Pittsburgh

ANY ACCEPTABLE TOOL control system must, first of all, furnish an exact record of all tools withdrawn from the crib and the signatures of the employees who have withdrawn them. It must also be economical to install and to operate, as well as easy to understand, both by the tool crib attendants and by the employees withdrawing the tools. All these provisions are embodied in a tool control system used in the various Westinghouse divisions.

Logically, this system is divided into three parts: (1) Permanent tool issues, (2) temporary tool issues, and (3) set-up tool issues.

Permanent tool issues—tools retained by the employee as long as he is employed on the job for which the tools are issued.

1. All permanent tools are issued on a "tool requisition" (Figure 1), made out by the foreman in duplicate and presented by the employee to the tool crib attendant who issues the tools and lists them on a "record of tools supplied" card (Figure 2), which is filed in the tool crib. The record card is signed by the employee to acknowledge receipts of the tools.

2. The original of the tool requisition is forwarded to the personnel department, where it is filed and retained as a "record of permanent issue." The duplicate is given to the employee.

3. When an employee is transferred from a department serviced by one tool crib to a department serviced by another, or leaves the company, he returns all the company's tools (as shown in his tool account) to the tool crib attendant.

4. The tool crib attendant checks off from "record of tools supplied," (Figure 2) all permanent tools returned by the employee. Where shortages exist, the cost of missing tools is recorded in ink on this form. Temporary tools are cleared separately in accordance with the procedure for temporary tools, but shortages, if any, are noted on this same form. This form is approved by the foreman and forwarded to the personnel department for comparison with the record of permanent issues (Figure 1).

Temporary tool issues—tools returned to the tool crib immediately after the work for which they were issued has been completed.

1. When an employee withdraws tools temporarily for specific shop orders, he makes out a separate "tool request" for each tool required. When a tool crib item consists of more than one part, the total number of parts making up the complete item are shown directly after the description of the item on all papers affecting it—for instance, 1 jig #124927-W-3 parts.

2. The tool crib attendant then (a) issues the tools to the employee; (b) stamps the date of issues on the "tool request"; (Figure 3 or 4); (c) places the signed tool request on the employee's check number on the checkboard (or in a special file when a checkboard is not used), which provides a running record of the number of temporary tools charged against each employee; (d) when tool request, Figure 3, is used, attendant places employee's metal check on the hook on the bin from which the tool was withdrawn; when tool request, Figure 4, is used, he places the duplicate copy of this form in a shallow pocket, or under a spring clip, attached to the bin in which the tool had been stored.

3. When the employee returns a tool to the crib, the attendant (a) removes the corresponding tool request from the checkboard or special file; (b) stamps the date of return on the tool request; (c) inspects the tool; if it is in good condition, he either detaches signed stub (Figure 3) and surrenders it to the employee as his receipt for the return of the tool and places upper portion of this form in tool request container, or surrenders original form (Figure 4) to the employee; (d) returns the tool to its proper bin. Then, when Figure 3 has been used, removes employee's metal check from the bin hook and returns it to the checkboard, or when Figure 4 has been used, removes the duplicate copy of this form from the outside of tool bin and places it in the tool request container.

4. Tool request containers receive either (a) the upper portion of Figure 3 or (b) the duplicate copy of Figure 4.

Either of these two documents represents tools returned, and any compilation made from the papers in the tool request container will be strictly in terms of tools returned as follows: (a) Total number of tools broken per section per day or (b) total number of tools of each type or size returned per day (tool activity record).

5. When the returned tool is broken or damaged to the point that it must be repaired or replaced, the employee fills out tool requisition, Figure 1, and has it approved by his foreman. The tool crib attendant staples this form to the corresponding signed tool request taken from the checkboard or special file and places it in the tool request container for proper recording and charging to the section which damaged the tool.

If an employee who has obtained temporary tools is unable to account for them satisfactorily, the procedure described in paragraph 4 under "Permanent Tool Issues," is followed.

Set-up tool issues—when more than one tool is required to do a lengthy set-up lasting through one or more shifts, and the tools are returned to the tool crib at the end of the set-up.

1. When an employee has to withdraw several tools for a special set-up, he (a) lists all required tools on one tool assignment (Figure 5) which is made out in duplicate; (b) fills in only the serial number of the tool assignment form on one of the supporting tool request and signs it; (c) retains the original copy of this tool assignment and turns over its duplicate copy and the serial-numbered tool request to the tool crib attendant.

2. The tool crib attendant then (a) issues the required tools; (b) stamps

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TOOL REQUISITION Tool Room X-24

Name of Workman	Section	Dept.	Check No.	Tool Sheet No.	Tool Checks Yes ☑ No ☐ No.	Lock Yes ☑ No ☐ No.
J. B. Doe	X	24	114	1	114	L 142

☑ New Tools ☐ Exchange | If "Exchange" State Why | Order No. | Charge Account

Quantity	Description	Item No.	Price per	Value
1	Mallet, - Rawhide			
1	"S" Wrench			
1	1" Chip Brush			
1	Flat Clamp			
1	Drill Press Chuck			
1	Cold Chisel			
1	6" Three Cornered File			

Date 7-6 1943 Approved John Smith FOREMAN

Figure 1. When the employee is to keep tools as long as he continues to work on the job for which they are issued, the foreman fills out a "tool requisition," which the worker presents at the tool crib

NAME J. B. Doe TOOL CHECK NO. 114

SEC.	DEPT.	CHECK	SEC.	DEPT.	CHECK	SEC.	DEPT.	CHECK	LOCK NUMBERS		LOCKER NO.
X	24	114							L 142		

AMT.	DESCRIPTION OF TOOL	AMT.	DESCRIPTION OF TOOL
1	Mallet Rawhide		
1	"V" Wrench	.60	
1	1" Chip Brush		
1	Flat Clamp	1.00	
1	Drill Press Chuck		
1	Cold Chisel		
1	6" Three Cornered File		

RECORD OF TOOLS SUPPLIED (SEE OTHER SIDE)

Figure 2. Tool crib attendant makes a "record of tools supplied." Missing tools are charged to employee, marked in ink on record. Other side of card has space for signatures of worker, foreman, personnel supervisor. A payroll deduction authorization (not shown) goes to payroll department

the date of the issue on all the supporting tool requests; (c) staples the serial-numbered tool request (Figure 3) to duplicate copy of tool assignment (Figure 5), or staples both copies of serial-numbered tool orders (Figure 4) to duplicate copy of tool assignment (Figure 5); (d) files the stapled forms under a spring clip near the checkboard or the serving window.

3. When the employee who signs for and withdraws the tools is taken off the work, he turns over to the employee succeeding him his original copy of the tool assignment (Figure 5).

4. This employee immediately checks the tools listed on the form and, when satisfied all are accounted for, gives a set of supporting tool requests to the tool crib attendant.

5. The tool crib attendant then (a) detaches that part of all the sup-

TOOL REQUEST

No. 277083

TOOL	QUANTITY	DESCRIPTION
	1	3/8" J. S. Drill, H. S.

I ASSUME RESPONSIBILITY FOR THIS TOOL AND AGREE NOT TO MISUSE OR REMOVE IT FROM THE COMPANY PREMISES.

SECTION X-24 CHECK 114

No. 277083 NAME J. B. Doe

TOOL LOANED 7-8-40

TOOL RETURNED 7-8-40

REPAIRED | REPLACED | AS NOTED ON FORM 3573

TOOL ORDER

WESTINGHOUSE FORM 22056A No. 1164

535	591	592	SECTION	CHECK #
		✓	X-24	114

TOOL # —

TOTAL VALUE $ ¢ 1 55

LOCATION R. 1- B 12

TOOL	QUANTITY	DESCRIPTION
	1	3/8" J. S. Drill, H. S.

I ASSUME RESPONSIBILITY FOR THIS TOOL

SIGNED J. B. Doe

TOOL LOANED 7-8-40

TOOL RETURNED 7-10-40

AS NOTED ON FORM 3573 ☐ REPAIRED ☐ REPLACED

Figures 3 and 4. "Tool requests" in the text refer to "tool request" (left) or "tool order" (right) or to a corresponding form used in any acceptable commercial system for control of production

porting tool requests (Figure 3), on which the original employee signed his name and returns them to him as his receipt for the return of the tools, or (b) returns to the original employee the original copy of all the original supporting tool requests (Figure 4) as his receipt.

This procedure is followed each time a change of operators is made.

6. When the employee returns these tools to the tool crib, the attendant (a) removes the serial-numbered tool request stapled to tool assignment (Figure 5) from the filing place; (b) stamps the date of return on each tool request; (c) inspects the tools; if they are in good condition he detaches signed stubs (Figure 3) and surrenders them to the employee; then he places upper portion of this form, together with the tool assignment (Figure 5) in tool request container; or he returns the supporting original copies (Figure 4) to the employee, places the duplicate copies together with the tool assignment (Figure 5) in the tool request container; (d) returns the tools to their proper bins.

7. When any of the set-up tools are broken or damaged, the procedure is the same as described under "Temporary Tool Issues," except that the tool assignment also is attached to the tool requisition.

8. Should an employee who has obtained set-up tools be unable to account satisfactorily for them, the procedure is the same as that described in "Permanent Tool Issues."

TOOL ASSIGNMENT

No. 3904

SET UP TOOLS FOR DRAWING NO. A-247293 ITEM 4 DATE 7-6-40

MACHINE	MACHINE NO.	SECTION	GROUP	CHECK NO.
Drill Press	123	X-24	9	114

QUAN.	DESCRIPTION	TOOL NO.
1	Drill Chuck	D 212
1	Drill Socket	D 342
1	Drill Sleeve	D 138
1	3/8" J. S. drill H. S.	--
2	U. Clamps	U-45
1	Drill Vise	V-71
1	"S" Wrench	—
1	1" Chip Hammer	—
1	J. S. Expansion Reamer	—

WORKMAN'S SIGNATURE J. B. Doe

SUPERVISOR'S APPROVAL John Smith

NOTE: THE EMPLOYE ON EACH SHIFT USING THE ABOVE TOOLS MUST MAKE OUT TOOL REQUEST FORM 21793 OR 22056 AND HAVE SAME TRANSFERRED TO HIS ACCOUNT, RELEASING PREVIOUS SHIFT EMPLOYE.

Figure 5. A "tool assignment" is issued when more than one tool is required for a set-up lasting through several shifts. These forms are backed up by "tool requests" presented by each individual who uses the tools as the shifts change

How One Small Plant Gets the Man-Hours It Needs

LEWIS K. URQUHART, Managing Editor, *Factory*

THIS IS THE STORY of a small plant that is doing a real job of licking an acute manpower problem. Note the present tense; the job is by no means finished, but it is far enough along to talk about.

The small plant is Albany Castings Company. It is located in the little village of Voorheesville which nestles down under the Helderberg escarpment 15 miles from Albany, N. Y.—out in the sticks, sure enough. It is a malleable iron foundry where a force of 185 men and women are turning out parts and fittings for war use.

The story is told here because, it seems to me, it contains pure inspiration for the thousands of small plants in this country that have had tough sledding in these days of acute manpower shortage. Here is the story of pioneering of the sort not uncommon when ours was an industry of small factories, when men in plant operation knew all they had to do to overcome any obstacle was to work like hell.

Here are ideas thousands of plants, small and large, can use. Not brand-new ideas necessarily, but good ideas that have been successfully lifted, adapted, and applied.

Here, indeed, is complete refutation of the oft-made assertion that good management is "big-plant stuff."

And here, finally, is proof that the small plant, far from paying a penalty for being small, actually has it all over the big plant in a lot of ways. Not the least of which is the fact that management of, say, a 185-man plant can still be on a personalized basis.

Rehabilitation

The Albany Castings Company started from scratch three years ago. The plant was in terrible condition. A reasonably expert catswinger could stand almost anywhere on the molding floor and swing a cat through the roof. Did I say *roof*? Did I say *floor*? Actually grass was growing where the floor should have been. There was no machinery except a broken-down air compressor. There was some question whether the original nine employees—keymen that they were—could ever get good iron out of the tumbledown hand-fired furnace. And even if they could melt iron, there was an excellent chance that they would not be able to anneal it in the watersoaked ovens.

They began with the old compressor, soon had it rebuilt. That gave them power—and, believe it or not, in 21 days they poured hot iron. That was, in point of fact, the start of a two-year program of clean-up and rehabilitation during which the maintenance crew began at the office end of the foundry and sort of crept up on the dirt and debris, finally reaching the far west wall and leaving a shipshape shop in their wake.

Labor Savers

For those first two years it was pretty much "the house that junk built." Then came rebuilding and replacement, notably an increase in melting capacity from 12 to 25 tons and the installation of labor-saving equipment and methods. Numbered among these labor savers are:

1. A monorail that makes the circuit of the molding floor. It is now possible to move hot metal from furnace to molds in bull ladles. There are 45 molders. They used to walk an estimated 35 miles every afternoon. For half the distance, they carried ladles full of hot iron. The ladles weighed 30 pounds; the metal, 60. The monorail cuts the walking—walking in a foundry is practically a dog-trot—to 5 miles, less than ½ mile per man. Result—faster pouring, more production, and less fatigue.

2. A pulverizer that takes the biggest backache out of the business. This equipment made it possible to increase melting capacity by 67 percent. It had been lying idle in another plant for 10 years—installed but never

Scene on the molding floor at Albany Castings Company before mechanical handling removed most of the backbreaking fatigue

used. In addition to removing the fatigue attendant on hand-firing, the pulverizer permits much more accurate quality control.

3. An electric truck that loads annealing ovens in half the old time. This one-man truck replaced a 35-year-old pneumatic charger that took three men to operate. The "new" truck is actually 10 years old, was bought for about 25 percent of its original cost from a friend who was not using it and was tired of watching it collect dust in his plant.

4. Fans on molding floor that have gone far to improve working conditions. There are six of these high-speed fans. They change the air every 8 minutes. It is now possible to pour metal in cold weather with the windows closed. It would be gross exaggeration to say that the air is like a breath of spring during the 50 minutes it takes to pour a heat, but the improvement is tremendous, and the men wind up their day's work in far better shape than they used to.

Manpower Crisis

But what has all this to do with licking a tough manpower problem? Plenty, as we shall see, because every piece of labor-saving equipment installed, every labor-saving method adopted, has been of incalculable help in solving the manpower shortage that hit the Albany Castings Company a year or so ago, and hit it with a vengeance—has been of incalculable help, I repeat, because it has gone far toward helping the company make best possible utilization of its manpower.

At first there was no shortage. When the company began operations, there was still manpower to spare in the Albany area. A few experienced coremakers and molders were picked up in Voorheesville, more in Albany and Troy.

Then things began to happen. First the government began construction of a huge holding and reconsignment depot. At the same time the big Schenectady plants began to reach out into the rural districts for workers. Glamour jobs began to compete with foundry jobs—with the inevitable result. And, of course, Selective Service began to make heavy inroads on the foundry force.

At this point the management began to scratch a little dandruff. It took stock of the situation, found almost nothing on the right side of the ledger except a few intangibles like youth, enthusiasm, determination, and an open mind. But on the debit side were:

1. *A critical transportation problem.* No public transportation facilities. Assuming workers could be lured from other areas, absolutely no way of getting them to the foundry.

2. *A hopeless housing situation.* Voorheesville facilities already overtaxed—and, of course, no new building in sight.

3. *A perplexing eating problem.* No restaurant in Voorheesville. The married men could carry lunches. Others simply out of luck.

4. *The undesirable nature of foundry work*—hot, dirty, backbreaking, hazardous. How to make people like it in spite of the obvious drawbacks?

5. *General labor shortage*, accentuated (as indicated above) by competition of glamour and high-wage industries in the area.

Transportation

One at a time these problems were tackled. First, transportation. A car pool was organized and successfully operated. Nothing unusual about it. Countless plants have done the same thing.

It was only the first step, however. Two company station wagons were converted into buses that made the rounds of Albany, Troy, and Cohoes. They helped, but obviously a couple of station wagons can do only so much. The next step, therefore, was to acquire a retired school bus. It takes no prizes, but it gets about and has done a lot to relieve the tight situation.

The final move was to buy a bus

Monorail now makes complete circuit of molding floor and hot metal is moved in bull ladles. Walking has been cut to the bare minimum. Net result is faster pouring, more production, less fatigue

that carries 40 people. The chassis is an old one, but the body is new. It should be good for the duration—and, so far as the transportation problem is concerned, it appears to be the crowning touch. There is no longer any problem. When, for instance, a November storm blanketed New York State with a couple of feet of snow, the Albany Castings transportation facilities functioned without a hitch. Of course someone was on the job most of one night with a bulldozer keeping the last mile of road open, but everybody got to the plant and did the usual day's work.

Housing

Adequate transportation was a big help, but only one step in the right direction. No matter how efficient the car pooling and the bus service, the foundry was still a long way out in the country. It was a hard, trying trip for many of the employees. Naturally they wanted to live closer to the plant, but there were no rooms in Voorheesville.

The answer was an unusual one. It was to set up a dormitory in the office wing of the foundry—and 28 men are living there today. Quarters are not too commodious, but they are clean and the cots are comfortable. There are radios, of course, and the large outer office has been turned into a living room and furnished with a few comfortable chairs. A pool table has been installed. All in all, it is several grades better than the average furnished room—and the "boarders" are spared the 25-mile-or-so round trip from Albany or Troy. Off one side of the "living room" is the president's own bedroom and bath. He lives there while at the plant and is thus available night and day.

The dormitory idea proved good, but it did not take care of the married men who wanted to move their families closer to the plant. The only possibility here was to pick up the occasional house vacated in and around Voorheesville, so the company asked women in the village to tip the personnel department off whenever they heard people were going to move. By means of this very efficient grapevine service, it has been possible to assist a number of employees in establishing their families nearby. The morning after one family moved in, the company got a telephone call from the irate housewife:

"You moved us here," she complained, "and now the sink won't work."

"I'll be right over," said the man at the company. Five minutes later a vice-president was down on his hands and knees making passes with a wrench. He figured something might happen if he poked about a bit—and something did. All of a sudden the water began to run off and another minor crisis in the affairs of the Albany Castings Company had passed.

It is not to be inferred that the housing problem is completely licked. There are still some employees who would like to move to Voorheesville, and with houses scarcer than hen's teeth it is going to be a long slow haul before they all get what they want. Certainly, though, it is possible to report progress at this time.

Eight occupations have been developed in which physically handicapped can be used. Coremaker's crutches stand beside his bench

Eating

This was relatively simple. The obvious thing was to put in a cafeteria, and one was installed forthwith in a one-story extension of the office wing—in what was once upon a time the machine shop.

It is a simple lunchroom. No pastel-tinted tile. No concealed lighting. No frills of any kind. For the most part, equipment is second-hand. The result is the kind of eating place where grimy molders feel right at home. It is managed by a man and his wife from Albany who serve some 125 during the noonday rush, and a steady stream of workers all day long who come in for doughnuts and coffee.

Quality is good. Prices are right. A heaping plate of meat, potatoes, and a second vegetable costs 35 cents. Soup is another nickel. An extra-large dish of ice cream costs a dime. The complete dinner with coffee, tea, or milk is 50 cents.

Better Work Conditions

So much for some of the simpler problems. How to combat the undesirable nature of foundry work was something else again. Much of this part of the story has already been told, however, in the foregoing paragraphs describing the various types of labor-saving equipment and methods that have been installed. All these things —monorail, pulverizer, and so on—have accomplished two results. First, they have saved man-hours and helped the company make better utilization of existing manpower. Second, they have all helped make the foundry a better place to work in. The fans, for example, that keep the atmosphere decent during the pouring hour. Or the monorail that takes a lot of fatigue

Crippled from the waist down, this useful worker used to get $1 a night for 12 hours' work as telephone man in a taxi station

out of the molding operation. What the monorail means to the molders is all summed up in the reaction of one of the negro workers when he was told of the plan:

"Pop," he said to the president of the company, "if you goin' to carry my iron, I'll give you 50 more molds every day." Theodore Roosevelt Murphy is living up to his word.

Competition from other industries is still tough to meet. The best answer that the company can give the worker who thinks the grass is greener on the other side of the fence is a very simple one:

"Your week's pay may not be quite so big here as it would be somewhere else, but we aim to pay it longer. We are on war work, true enough, but this plant is not a war baby. Our chances of having a job for you after the war are mighty good."

Tapping New Sources

So far, so good. All these things have helped. But there was still the basic problem of getting manpower—finding peope who were willing to try foundry work.

It was in the summer of 1941 that the thin trickle of applicants capable of arduous foundry work dried up completely. This was a new situation. Progress for the moment was stymied. At this point, therefore, the company reluctantly sought help from the War Manpower Commission — reluctantly because, after all, the management comes pretty close to being rugged individualists.

Women. WMC suggested ways not only to *find* new manpower but also to *utilize* new manpower economically. First thing was to find jobs. women could do. Today there is a woman on the maintenance crew, and a dozen women are at work making cores. They learn quickly and in a short time are making as many cores as the men. They have their own workroom apart from the men and are among the most faithful workers in the shop; their "presenteeism" record is excellent.

Handicapped. By consolidating certain kinds of light work, WMC developed eight occupations in which physically handicapped people can be utilized. Today, fifteen "handicaps" are on the payroll. Today four pairs of crutches lean against coremakers' benches. One man, father of five girls, had been unemployed for two years. An infantile paralysis victim, he had to brace the upper part of his leg with one hand in order to walk. His first job was sorting castings in the shipping room. Today, with a new brace on his leg, he is head shipper.

The straightening press operator is a 90-lb. hunchback. He is doing a full day's work. One core scratcher is crippled from the waist down; he used to get $1 a night for 12 hours' work as telephone operator in a taxi station.

All these handicapped workers do their jobs as well as or better than the average able-bodied employee. Their attendance record is excellent. Their payroll deductions for War Bonds are above average for the plant. They are paid the going rate of the job classifications in which they work.

Negroes. Prior to August, 1942, no Negro worker had applied at the foundry. Today it has 20 percent colored help. One Negro is the best bench molder. Six others are better than average squeeze machine molders.

Parolees. Next suggestion from WMC was that the company try the State Division of Parole. Today, twelve parolees are on the payroll as molders, coremakers, chippers, and laborers. The company relied on the judgment of the parole board and in every case the men selected have set outstanding records for reliability and effiiency.

Part-time workers. The utilization of part-time workers was undertaken also at WMC's suggestion. A survey showed that the company could use a total of 48 man-hours per week on the day shift and 76 man-hours per week on the second shift. An ad was run in the classified section of both Albany newspapers. Between 75 and 80 people telephoned the plant during the three days the ad ran. This preliminary screening was suggested to eliminate unnecessary trips either to the U. S. Employment Service or to the plant. As a result eight applicants were interviewed of whom three were subsequently hired. The names of about 25 other people were referred by USES. Following a telephone interview, eight came to Voorheesville and four were hired, but only one is now working.

It is too early to evaluate this experiment. The company has in its files names of men and women it is attempting to place in jobs where their skills can be utilized. One is a manual training teacher for whom part-

time work in the pattern shop is being planned. Another is a CPA who has expressed a desire to contribute several hours a week to work in the accounting department. Another is a housewife who is going to work two days a week in the payroll department.

High-school boys. Six boys make up what the company calls its "commandos." They are picked up every Saturday morning in Albany, taken to the plant, and delivered to a special commando foreman, whose regular job is selling disinfectants. He is at the foundry every Saturday and sometimes on Sunday. The company does not like to work the boys two days in a row, however. They are paid 55 cents an hour and do all kinds of odd jobs—policing the grounds, cleaning windows, and so on.

The boys were recruited through USES. They come from good average homes and, in order to set at rest any fears the parents might entertain because their sons were working in a foundry, the vice-president wrote them as follows:

"Today your son was hired at this company as a member of the part-time working force. As he has probably told you, this is a malleable iron foundry, the production of which is entirely devoted to urgently needed war materials. We want you to know that we feel you have a fine son and while he is working at our company it is our responsibility to see that he in no way endangers his health or safety . . .

"When I was 16 years old I worked every Saturday and all summer long doing exactly the same work that your boy is now doing. My twin brother Henry, who is plant manager of this foundry, did exactly the same thing. I can assure you that we got plenty dirty and that our mother was sometimes a bit concerned. The work not only never hurt us but we both feel it was a great experience. We appreciate it more as time goes on.

"If at any time there are any questions concerning your son's employment about which you would like to talk with us, please call us."

Training

The need for training was early realized, and both Job Instructor and Job Methods Training courses have been given with real success.

Thirteen foremen and supervisors completed the JIT course last February. Taken altogether they had a grand total of 200 years of experience in the malleable iron industry. There were three obstacles to overcome, however, if the company was to continue to produce ever-increasing quantities of castings for war products. First, none of these keymen had a well-formulated technique for passing information on to others. Second, years of foundry labor surplus had nullified the need for quick training; foundrymen had years to learn the trade in and just picked it up as time went on. As a result, foundry foremen as a class knew nothing about teaching skills. Third, the draft had been cutting deeply into personnel, and less than 3 percent of 1943 applicants had ever seen the inside of a foundry.

JIT supplied a simple technique that could be used by any supervisor to break in new help and cut training time. The results have been gratifying. Half of the company's 45 molders learned their trade at this plant. All the women and three-quarters of the male coremakers were taught by company instructors. Whereas the company used to figure that it took at least a year to make a reasonably good machine molder or bench coremaker, it now believes that competent workers can be turned out in half the old time. Estimates for training time as set forth in the company's manning tables indicate that similar speed-up has been possible in training for other jobs.

Women help Albany Castings cure manpower troubles: today there is one woman on the maintenance crew, and twelve make cores

JMT was next on the docket. Eleven members of the organization took this course which equipped them with the techniques needed to analyze jobs and determine where available manpower and machine power could be used more effectively.

The men who took JMT came up during the course with eight proposals which were at once put into effect and came close to saving the company $10,000 last year and probably decreased man-hours per ton of castings at least 3 percent.

Suggestions

The men who took JMT have passed their knowledge on down to the men who work with them. The result has been an increase in the number of suggestions from workers. Here are a few examples:

1. By re-engineering several jobs and through the subsequent develop-

ment of a second shift, much needless overtime has been eliminated.

2. A core mixture was developed that prevents cracking of large thin-walled castings.

3. By eliminating three handlings of large castings during the cleaning operation, output on that particular job was increased 20 percent.

4. A new method of transporting cores to the molding floor eliminates breakage.

5. Vibration set up in a long core bench was causing considerable breakage. The remedy was simply to saw through the bench at intervals and make what are, in effect, individual workplaces.

Awards are commensurate with the value of the suggestion, have run as high as $100. The suggestion system is now run by the newly formed labor-management committee.

Labor-Management Committee

The company did not rush into the labor-management committee thing. Not till last fall did it decide to try Donald Nelson's big idea. Suffice it to say that it is working out thus far exactly as the WPB chairman intended when he originally asked industry to try it. The company is extremely enthusiastic and is not the least bit concerned over the possibility that labor may want eventually to take over part of management's job. Possibly the idea is working because this is a small plant where everybody knows everybody else—and so knows exactly what goes on when the committee gets together, as it does once a week.

The committee does one thing that may or may not be new. It makes a practice of inviting a guest to each meeting and has further made it known that any member of the organization can obtain permission from the committee to attend the meeting. Ulysses G. Goods was one of the first to take advantage of this invitation. Furthermore, when he got to the meeting, he suggested that his Negro associates on the molding floor should be represented on the committee. Goods was elected and is today one of the most useful members.

Absenteeism

One of the first problems tackled by the labor-management committee is the still serious one of absenteeism. Last spring absenteeism was soaring up around 8 percent. Today it is below 4 percent. There is still room for improvement.

The improvement already made is due to a number of things. First, attendance charts were posted on bulletin boards. Absences were marked by colored pins, the colors denoting the various reasons. Drunks get a large red pin. These charts plus follow-up interviews worked very well for a time. Then one Monday morning there were not enough molders at their benches to warrant melting iron. The company arranged to have a Navy man talk to the employees the next day. He told them that they, too, were playing a part in the war—not as glamorous a part, to be sure, as the fellow flying a plane, but a mighty important part just the same. That talk made a big hit and it, plus the attendance charts and exit interviews and a weekly bond raffle, has gone a long way toward keeping the figure within bounds.

A few pertinent facts have come out of this small company's study of absenteeism that may be helpful to others. There is apparently no relation between absenteeism and distance traveled to and from work. It happens that 8 percent of total personnel comes from the Troy-Watervliet-Cohoes area, which is 15 to 20 miles away. Absenteeism for this group runs only in the neighborhood of 1 percent.

Of the 40 percent of the men who come from Albany, the chronic absentees are men for whom the company provides station wagon transportation. In the rural areas absenteeism is about average. The Voorheesville contingent represents just as big a problem as any of the worker groups from more distant points.

Although the greatest percentage of absenteeism is in the labor gang, the lowest paid bracket, the company does not feel that there is any correlation between low wages and absenteeism. Absenteeism is high in this department because of offenders with whom the company would not put up under ordinary conditions.

The vast majority of the people in the plant—both men and women—have good attendance records. The company record would be a handsome one if it were not for a group of about 25 chronic offenders.

Turnover

To quote the vice-president, his company's turnover record is still "stinko." It is actually running around 5.7 percent per month.

Here again a good bit of progress has been made because as recently as last June and July the rates were, respectively, 8.5 and 11.1 percent. This statistical record, however, as in the case of absenteeism, does not give a true picture of the situation. Thirteen out of nineteen separations in July were men who were put on the payroll and lasted less than one full work week. The company believes that this poor record may be attributed to indiscriminate hiring prompted by an all-out effort to produce castings in ever-increasing quantities. In order to give over-age men, submarginal labor, and handicapped people a chance to show whether or not they could stand the gaff of foundry work, the company often accepted applicants in whom it had little confidence. It just took chances. It has now matured to the point where selection of new employees is on a sounder basis. This will undoubtedly decrease turnover. Today men are not being hired and rushed into jobs for which they are not suited. There are still separations that keep the turnover rate high enough, but at least the company is now keeping almost every new man it hires.

Production Record

Is the end-result more malleable iron castings? The figures tell that story. Albany Castings production for 1943 was almost exactly double the figure for 1941 and just about 30 percent above that for 1942. There is proof, if proof be needed, that this kind of manpower management works.

The paper shortage is more serious than ever

Ask yourself these five guiding questions about every piece of written or printed matter which you order and use:

1. **Is it necessary?**
2. **Can lighter paper be used?**
3. **Can a smaller size be used?**
4. **Can the number of printed pieces be reduced by pruning distribution lists?**
5. **Is an excessive inventory of paper on hand? (Sixty days is the allowable margin.)**

Supervisory Problems—No. 10

WHAT WOULD YOU DO IN A CASE LIKE THIS?

Tenth in a series of articles on methods used at Carnegie-Illinois Steel Corporation, Pittsburgh, to stimulate discussion in foreman training classes. Developed by R. J. Greenly and E. B. Mapel, Industrial Relations Division

Joe is a foreman of an open hearth department crew. About a month ago one of his new men, who at that time had only twelve weeks' service, complained of a sore back. Joe sent the man to the hospital for an examination. The doctor reported that although he could find no sign of injury or history of illness, it would be desirable to keep the man on light work "for a short time." Joe put the man on some light work which was not really necessary, but which served to keep the man on the payroll.

During the next month the man maintained that his back was not improving and on several occasions objected to the suggestion that he resume his regular job. Joe overheard the man say to another, "The way to get a soft job is to pretend your back is hurt—they can't prove a thing!" Joe then felt certain that the man was a malingerer.

One day two transfers left Joe shorthanded. Joe then instructed the man to resume his old job. The man protested and refused to obey the order. When Joe insisted the man became abusive. He swore at Joe, and threatened to "report" him. Joe sent the man home after telling him that he was to be discharged, and instructed him to come out the following day to get his pay and termination papers.

When leaving the mill the man stopped to talk it over with the director of personnel. The director told him to report for a physical examination on the following day. The man inferred from this that the foreman's notice of discharge might be reversed. When the man came out on the next day he punched the time clock as usual and reported for work. He told Joe that the director of personnel had suggested to him that he could not be discharged. Joe put the man on light work, arranged to send him to the hospital for an examination later in the day, and voided the discharge order.

The following statements apply to this situation. Study each one carefully. If you agree, put a circle around the "T" following the statement. If you do NOT agree, circle the "F." If you are in doubt, circle the "??"

1.	The doctor should have stated exactly how long the man was to remain on light work and when he was to report for re-examination.	T	?	?	F
2.	Joe should have accepted the doctor's report until a medical examination substantiated his opinion that the man was a malingerer.	T	?	?	F
3.	The doctor should not have recommended light work since there was no evidence of injury or history of illness.	T	?	?	F
4.	Joe should have sent the man to the hospital for an examination to get authority for returning him to his regular job in the department.	T	?	?	F
5.	The man was justified in refusing to take heavy work without medical authorization.	T	?	?	F
6.	Since the man was in his probationary period, he should have been discharged as soon as he complained about his back.	T	?	?	F
7.	The man should have been given a temporary lay-off and told to report when his back was well.	T	?	?	F
8.	It would have been illegal to give the man a temporary lay-off in this case.	T	?	?	F
9.	Joe should have had the man work out the remainder of the day before informing him of his discharge.	T	?	?	F
10.	The director of personnel should have consulted with Joe before advising the man to report for a medical examination.	T	?	?	F
11.	The director of personnel should have refused to talk with the man until he was asked to do so by the foreman.	T	?	?	F
12.	The foreman should have requested his superintendent's approval before taking such strong action as discharge.	T	?	?	F
13.	The rights of a probationary employee should be the same as the rights of a regular employee as far as discharge is concerned.	T	?	?	F
14.	It is bad for employee morale and discipline when plant officials appear to disagree in their decisions.	T	?	?	F
15.	It is impossible for a foreman to be effective in maintaining discipline if his men know that he sometimes fails to get the support of higher officials.	T	?	?	F
16.	A man who claims to be ill or injured should never be discharged without the approval of the superintendent, industrial relations, and the plant medical officer.	T	?	?	F
17.	Even if the company is justified in discharging this man, it would be a wise move to give him another chance in some other department.	T	?	?	F

MANAGEMENT SHORTS

Readers are invited to contribute brief articles, illustrated when possible, reporting out-of-the-ordinary management accomplishments. Accepted articles will be paid for

One Way to Speed Cafeteria Service

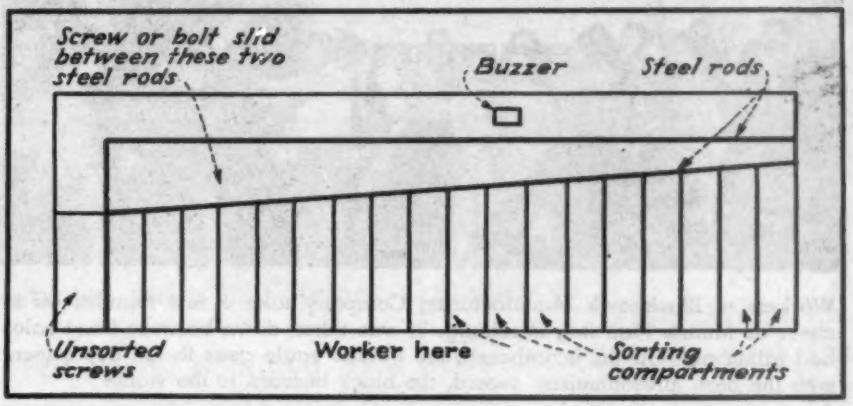
LUCIUS FLINT, Los Angeles

Peak-hour feeding capacity has been practically doubled at the employee cafeterias of the Denver Ordnance Plant, operated by Remington Arms Company, since conspicuous tray-return stations were installed.

It is necessary to feed in each cafeteria at the lunch hour about four times as many people as those cafeterias have seating capacity. Only prompt removal of dirty dishes and a staggered lunch hour system make this possible.

It was found that, even when it was possible to get enough girls to handle dish removal, delays were inevitable. But now that each employee removes his own empty tray as he leaves the table, seating space is freed instantly for someone else. In addition, the labor of 10 girls per day per cafeteria is saved.

The tray returns are handled at a long booth built in previously unused space along one wall. There are several low windows in the front wall of the booth. Above each is posted, "Return Trays Here."



As still another means of regulating the flow of traffic so that the cafeterias can handle everyone, the company has issued lunch hour passes to all employees. These cards specify the time at which each worker is permitted in the lunchroom. Whenever congestion seems to be developing, a guard is placed at the door to ask for passes. Employees are allowed 30-min. lunch periods, the lunch hour being staggered over a two-hour period.

A booth built in the lunchroom wall facilitates prompt removal of dirty dishes

Blind Workers Sort Screws and Bolts

JAMES MONTAGNES, Toronto, Canada

Blind workers at Aircraft Repair Ltd., Edmonton, are now sorting screws, bolts, nuts, and washers taken from dismantled aircraft, for re-use after the aircraft is overhauled and repaired.

The blind workers are seated in front of a bench containing a number of compartments. On the left is a pile of screws and bolts to be sorted into length groups and dropped into the bins before the worker. Two steel rods are set on the bench above the bins, one rod being straight, the other slanted. As the worker places the screw to be measured between the two rods, he moves it along until both ends touch the steel rods, when a buzzer sounds, and the worker drops the screw into the bin immediately below this point.

Sightless workers also sort nuts according to diameter and screws and nuts according to thread sizes. There are 32 different thread sizes and 50 different lengths of screws and bolts to sort. Preliminary sorting is largely by feel. Precision and final sortings are by the device described above, and for thread sizes a thread gage designed at the plant is used. One blind worker at this plant also does intricate cable splicing.

•

Eagle on Scoreboard Rewards Presenteeism

A golden eagle is the goal at Blackhawk Manufacturing Company, Milwaukee. It flies on the scoreboard above the department that has the best "presenteeism" record for the week. The "honor" for absenteeism is a black buzzard—whose

Workers at Blackhawk Manufacturing Company take a few minutes off to cheer as Minute Man flag is rehung. It was taken down because bond sales had fallen off. On the scoreboard, the golden eagle goes to the department with the best "presenteeism" record, the black buzzard to the worst.

presence is made more noticeable because the American Flag that denotes 90 percent of the department's personnel are bond buyers also is absent—it cannot fly beside a black buzzard.

The scoreboard plus rallies and drives put on under the direction of departmental captains took less than a month to show results—489 fewer man-hours were lost, and six departments reached 100 percent in bond buying. The Minute Man flag, which had been taken down because of the drop in bond buying that followed the income tax boost, was put back up again.

To keep the scorekeeping fair, all absentees, regardless of cause, are counted.

•

"Here is our secret weapon," says Continental Screw Company, New Bedford, Mass., showing picture of Joe Wessiack who has never been late or absent from work in 36 years of service.

•

Character Humanizes Messages to Workers

SOURCE: Munsingwear, Inc., Minneapolis

Munsingwear Mac, the knitting spool man, is a character created to serve as a mouthpiece for ideas. He has helped a lot to humanize messages to employees.

He was introduced to Munsingwear people in the employees' manual, a 24-page booklet called "About You . . . and Us." Mac appears one or more times on each page, and takes the reader on a personally conducted tour through "our past," "your hours," "your earnings," time clock cards, group insurance, credit union, hospitalization, and so on through what Munsingwear provides and requests.

Mac has also appeared as Prince Charming in "A Grim Fairy Tale," which is aimed at conservation. Mac points out the facts of waste to Leadfoot Lulu, who "was a little too tired to lift her foot from the treadle when she finished a seam." Of course, Lulu hadn't realized that thread alone cost the company $172,269.27 last year, that the trimmings she used totaled $402,723.75. Lulu was certainly shocked. She could hardly believe that if she and each of the other Leadfoot Lulus would just lift her foot off the treadle in time, they would "reduce waste something like $11,499.86 in money and lots and lots of material for vital war and civilian production." It all netted down to Lulu's saving and sewing happily ever after!

Munsingwear Mac also shows up now and again on bulletin boards and in safety posters. The company is sure that employees really read and heed messages and announcements in which Mac plays a role.

This work cabinet, equipped with rollers, makes the rounds of the General Electric plant, Fort Wayne, Ind., twice a day, carrying the necessary tools for the adjustment of safety glasses. The cabinet was made from an ordinary work bench having drawers and cupboards

MAINTENANCE SERVICES

The well-maintained plant is the high-production plant

SELECTION • INSTALLATION • INSPECTION • UPKEEP • ORGANIZATION

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CHANGE OF ADDRESS

McGRAW-HILL PUBLISHING COMPANY
330 West 42nd Street, New York, 18, N. Y.

Director of Circulation:
Change my address on Factory Management and Maintenance

From .....

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To .....

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Signed .....

FACTORY MANAGEMENT AND MAINTENANCE
McGRAW-HILL PUBLISHING COMPANY, INC., 330 WEST 42d STREET, NEW YORK, N. Y.

MAINTENANCE as the Editors See It

Maintenance Faces Another Troublous Year

MAINTENANCE EXECUTIVES face a year that will bring plenty of problems, both new and old. For many plants, this year will encompass the trying period between a wartime and a peacetime economy. The ability to make sound plans and execute them in a hurry, on short notice, will be invaluable.

Neither of the two major wars in which we are engaged has been won. It is possible, of course, that the European conflict will be over this year. Nevertheless, Charles E. Wilson, executive vice-president of the War Production Board, recently warned industry that overall production of the implements of war—ships, aircraft, tanks, ordnance—must be 80 percent greater in 1944 than it was in 1942. The required increase in the output of several items is, of course, much greater than this over-all figure.

To the maintenance department in plants that are producing these items, increased production means a stiffer fight than ever against breakdowns and other causes of production delays. Operation 24 hours a day is taking its toll. Equipment of all kinds is beginning to show the effects of the heavy demands made on it. As a result, it will require more maintenance attention.

There will be, too, an increasingly insistent need to keep all plant property in as good condition as possible, against the return of peacetime. Buildings and all yard structures, in particular, must be painted and protected in every way against corrosion and other forms of permanent damage. Any plant that enters the post-war era with run-down buildings and other permanent structures will be under an unnecessary handicap.

All these things must be done despite a shortage of manpower that is not likely to be eased for some time to come, and may in fact become more serious. This condition will put a premium on the use of every device—better planning, scheduling, supervision, incentives—for utilizing manpower more effectively.

Along with these day-to-day responsibilities there must be careful planning of work to be done in meeting future needs. We refer, of course, to the time when the plant goes back to the production of civilian goods.

It is likely that not all these requirements can be foreseen now. At the same time there should be little difficulty in recognizing obvious opportunities for improvement, changes that will improve plant efficiency, and betterments that must wait until men and materials are in more plentiful supply.

A list of such items, with beforehand decisions as to when, how, and in what order they are to be done, may save hurried planning and haphazard execution later on.

To a number of plants, partial or complete return to the production of civilian goods has become a reality. Many contracts with war plants have been canceled. Large stockpiles of military equipment and of some raw materials and semi-finished products have been built up. Therefore it is to be expected that, barring unexpected situations, more and more plants will be left free to resume the making of non-military products.

In all such plants, maintenance is likely to have a big job on its hands. Priorities have not yet been abandoned. Many materials and kinds of equipment are difficult or impossible to get without a high priority. Hence there still remains the necessity for getting along with, and getting the most out of, the equipment on hand.

There is likely to be a man-sized job of moving equipment and services around to meet new conditions. Making such betterments as can be handled now. Doing all that can be done to put or keep the plant in condition for low-cost production. In most instances there will be, no doubt, plenty of obstacles to hamper execution of major jobs where, how, and in the manner desired.

And so, again, maintenance will have good use for all the ingenuity and resourcefulness it can muster. With them must go managerial qualities of a high order.

The fine job that maintenance has done during the year just past is brightly reflected in industry's astounding output of all the many things that are needed by the armed forces.

There is every reason to believe that the job maintenance does this year will be equally outstanding. The editors of FACTORY will continue to do their utmost to help maintenance executives make it so.

First shift foremen meet daily with the second shift foreman and the general maintenance foreman. Second shift foreman transmits orders to the third shift foreman, who reports to the first shift foreman

Orders Pass Between Shifts in Foremen Conferences

F. D. SWARTHOUT, General Foreman of Maintenance, Brown-Lipe-Chapin Division, General Motors Corporation, Syracuse, N. Y.

A SYSTEM recently put into operation has been successful in securing smooth execution of maintenance work that is started by one shift and must be carried on or completed by succeeding shifts. This is a problem that gave us trouble when multiple-shift operation was started some time ago.

One might think that such a problem would not, or should not, arise. In reality, it does arise unless suitable measures are taken to prevent it, largely because we are dealing with the human element, and the fact that it comes up is not necessarily a reflection on the men or their supervisors. It arises rather from the difficulties and opportunities for misunderstanding

★ The well-maintained plant is the high-production plant

naturally encountered when one group of men, say the second shift, attempts to carry on work that has been started by another group. I am referring, of course, to construction and alteration work, major repairs, extensive relocations of equipment, and like activities, rather than work of a routine nature, such as inspection or lubrication.

Unless there is some effective arrangement for passing information along from one maintenance shift to the other, some time is certain to be wasted by the men on one shift, in finding out what the work order calls for, and just what has been done by the preceding shift. Again, one foreman may tackle a job in a different way or perform various operations in a different sequence. Unexpected difficulties or interruptions may have interfered with the normal procedure in handling a job. Perhaps the foreman of the group that started the work has had the advantage of important verbal directions or discussions which do not appear on the work order. This is especially true of the first shift. Hence the foremen of the succeeding crews know nothing about them.

Such seemingly trivial matters as

Brown-Lipe-Chapin

WORK ORDER REQUEST

TO DEPTS: 93 DATE 5/13/43

ESTIMATED COST

MAKE BUILD | INSTALL MOVE | REPAIR REPLACE | CHANGE CONVERT

Order No.

Tool No.

Model No.

Charge Acct. 544

Charge Dept. 575

Please build one table for comparator. Table to be 33" high from floor and to be equipped with roller casters

See Malson for dimensions

REQUESTED BY	B. E. Malson	FOR DEPT. NO.	575	DATE WANTED	Soon
APPROVED BY	F. W. Claypole	CUSTOMER		CUSTOMER'S ORDER NO.	

Orders for work are made out in duplicate. Originated by a department foreman, they must be approved by factory manager or superintendent

Job	Job Given To	Date	Disposition	Date
Build 2 platforms for broach	Waynai	4/24	Done	4/28
Make one strong box	Waynai	4/24	Cancel	4/28
10 covers for pots	Waynai	4/24	Done	4/27
Casters on chip box at mach.#2967	Cunn.	4/26	"	5/5
Install safety guards on grinder #2578	Waynai	4/26	"	4/29
Repair switch on Cin. grinder #601	Evans	4/26	"	4/29
Hoods on Slow Rite Speed mach. #514F	Waynai	4/26	"	4/27
Burn out guard on sanding machs.	Waynai	4/26	"	4/27
Move switch box on mach. #196	Evans	4/26	"	4/27
6 barrel supports for stamping hardwood	Waynai	4/26	"	4/27
Thompson grinder 6" in Bay 5B4	Maahs	4/27	"	4/27
Rebuild screens for new quench tanks	Waynai	4/26	"	6/8
Cut hood on strap mach. 4C6	Maahs	4/26	"	4/27
Place & lag Consolidated Press #8	Maahs	4/26	"	4/27
Make 5 spirit tanks into drip hoods	Maahs	4/27	"	5/5
Make shelf on grease tank	Maahs	4/27	"	4/29
Check ceiling for acid links BF1	Gilson	4/28	"	4/30
Place shields inside of coupling guards	Waynai	4/28	"	4/30
Lag in 2 Delta sanders 4B7	Coon	4/28	"	4/29
Level Thompson grinder 5B4	Maahs	4/28	"	4/29

Work orders are entered on the maintenance department job sheet, then turned over to one of the first shift foremen, who assigns the work

failing to draw out all needed equipment or material, or leaving these items scattered around at the end of the shift, may provide an opportunity for complaint that tends to cause hard feelings and general dissatisfaction, and may too easily result in plain old-fashioned buck-passing.

To eliminate possibilities of confusion and to insure maximum efficiency in the execution of work done by the maintenance department, the following procedure has been evolved for handling work that is not of a strictly routine nature.

Orders in Duplicate

All orders for work are made out in duplicate on the work order request shown at the left (top). Usually these orders are originated by a department foreman, but they must be approved by the factory manager or superintendent if the estimated cost exceeds a certain value. One copy of the order is kept by the department requesting the work. The original is sent to the maintenance department where it is entered on a department job sheet (left, bottom). The work order is then turned over to the electrical, carpenter, pipefitter, or other foreman on the first shift who, in turn, assigns it to the men best suited to do the work.

Many jobs can be completed, of course, by one shift. These jobs present no problem. If a job cannot be finished in one shift, we allow the group that started the work to finish it on its next shift, whenever it is possible to delay completion that long. In these instances there is no problem of liaison between shifts. Much of our work is of rush nature, however, and must be finished as quickly as possible.

The first maintenance shift starts at 7 a.m. and works until 4 p.m. The second shift starts at 4 p.m. and works until 12:30 a.m., while the third shift, starting at 11 p.m., knocks off at 7:30 a.m. The foremen on the second and third shifts come in an hour before their men report. Every afternoon at 3:15 the foremen of the first and second shifts meet with the general foreman of maintenance to report on the status of the jobs they are doing, and bring up any matters of common interest. At these meetings the foremen on the first shift see to it that the second shift foreman is fully informed about all details of the job which he must pick up from the first shift and carry on. If it seems desirable, the two foremen may go right out onto the job and talk things over. In this way the chances for misunderstanding are reduced to a minimum.

A trip out into the shop while the foreman of one shift tells the foreman of the next how to move the machine and where it is to go. Verbal instructions plus written orders leave no room for errors

In addition, the general foreman of maintenance gives the second shift foreman a list of the jobs that have been assigned to that shift. The jobs that are urgent are marked by a star.

The second shift foreman has to assume a good deal of responsibility on his own initiative without executive direction. He must make decisions based on his knowledge gained through verbal and written instructions given him before the start of his shift.

A Small Force

The third shift maintenance force is the smallest. It is primarily responsible for taking care of any emergencies that arise in the early morning hours (11 p.m. to 7:30 a.m.) and carrying on rush work started by the first or second shift. Therefore, the foreman of the second shift passes along the work sheet for the third shift. The foreman of this shift then discusses with the first shift foremen any matters that need to be brought to their attention, and the cycle is complete.

By this method of maintaining liaison among the three shifts, through verbal discussion and written orders, we are getting the maximum of cooperation, and have reduced to the vanishing point all opportunities for misunderstanding or shifting of responsibility.

Job Check Sheet

Issued to Maahs **Date** 6/9/43

Jobs Assigned	Account No.	Disposal Definite Information
*Move tanks basement to hardening	83–543	Not finished
*Cut in shelf in crib on 5 Bay 5C20	97–544	Done
Clean up east yard	10,740PW	Did not do
Clean up areaway timbers on truck	10,740PW	Finished
*Load #6 Bliss Press	10,523W	Finished
*Clean .50 cal. range	575–550	Third shift
*Clean .30 cal. range	575–550	Third shift
*Repair targets .50 cal. range	575–550	Finished
Rearrange Dept. 93	10,520W	Cleaned BG25
Catwalk oil room on 2	10,500W	Paint only
Equipment Used	**Location—Left at Bay, Crib, Etc.**	
#1 Torch	BC21	
#4 Torch	4D1	
Arc Welder	3B10	
Tractor	1C5	
Remarks		
Don't forget 5 minute safety talks to men		
Check range to be certain it will be ready at 7 a.m.		
See other side for sketches		

Work sheet for jobs to be done on the third shift is made out by the general foreman, given to foreman of that shift by second shift foreman

Easy Way to Find Power Required by a Drive

E. H. FREDRICK, Electrical Department, Allis-Chalmers Manufacturing Company, Milwaukee

CURVES PRESENTED in this article will be helpful in determining the size of motor required for a drive. When the characteristics of the driven machine are not available, it is often difficult to estimate closely the power required. Since so many variables are encountered, no universal formula can be applied. Each case must be considered separately.

The important factors affecting the size of motor required are: Continuity of operation; available reserve capacity; duty cycle of the drive; severity of loading. The first two items are self-explanatory, but the last two merit some discussion.

Motor loads may be divided roughly into three general classifications:

1. Constant-load drives such as fans, blowers, centrifugal pumps, where the load is usually constant for long periods.

2. Pulsating loads such as compressors, reciprocating pumps, crushers; and machine tools with flywheels, such as punch presses and shears.

3. Highly fluctuating loads, such as are imposed by most machine tools, hoists or cranes, and certain pumps.

Any motor will withstand a peak load considerably in excess of its rating, provided the peaks are not too frequent and not of too long duration. One-minute peak loads are considered normal. Direct-current motors, in the general-purpose sizes, will successfully carry 1-min. peak loads of 150 percent of rating without injurious sparking at the commutator. At rated voltage most induction motors will carry 1-min. peaks in excess of 200 percent of their ratings. For longer peak loads, capacity of motor must be increased.

When dealing with constant-load drives, the horsepower required can usually be determined quite accurately either from data available on the driven unit or by test.

With pulsating and highly fluctuating loads it must be remembered that the peak capacity of the motor may be utilized to reduce the nominal horsepower rating of the motor. For example, assume a drive requires 14 horsepower for a period of 30 seconds

With the accompanying curves, the size of a motor for a drive can be determined approximately with one ammeter. It is advisable to check the voltage, too, when a test is run, to be sure it is close to normal

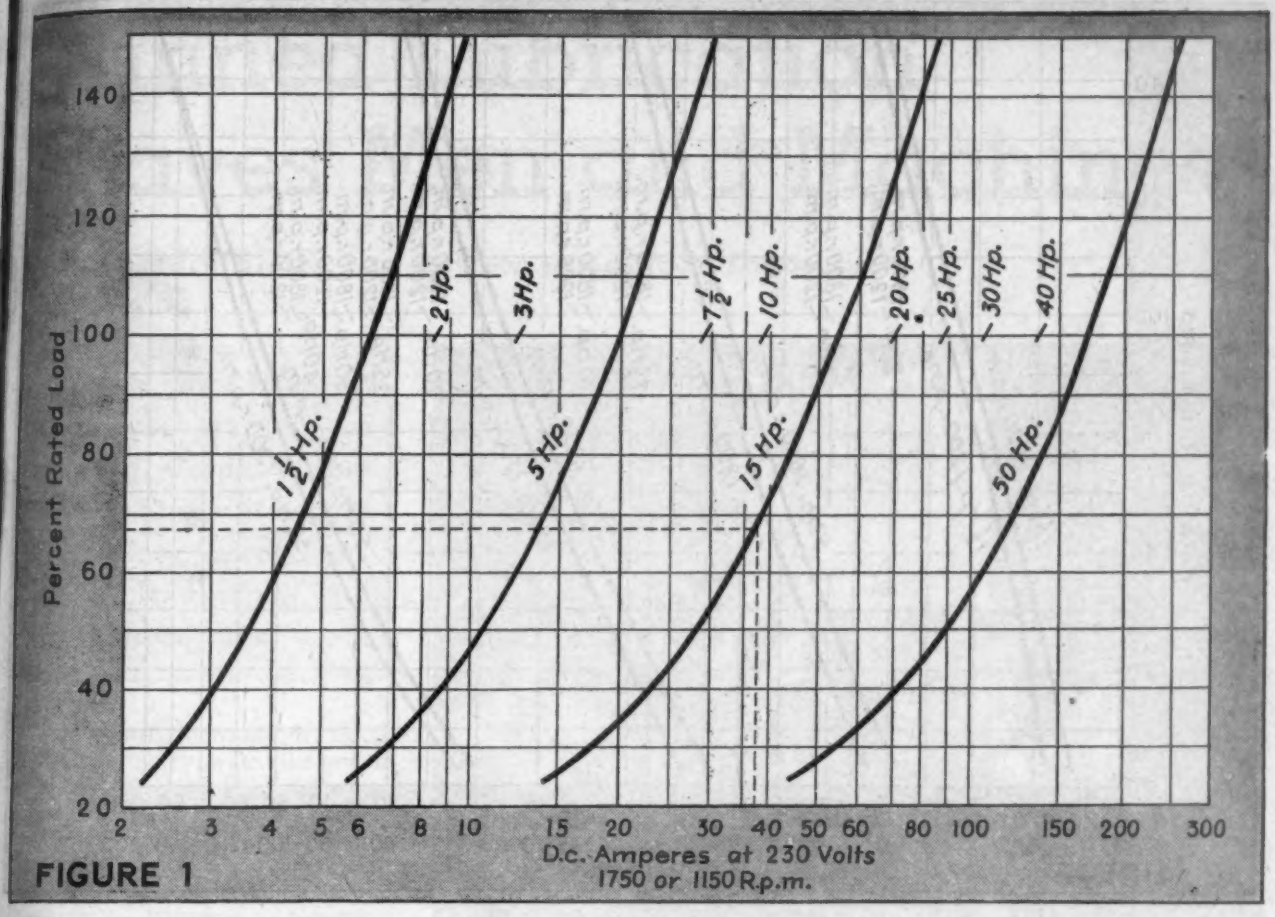


FIGURE 1

out of 5 minutes. For the remainder of the time the motor is required to deliver only 5 horsepower. In this instance a 15-hp. motor would be much too large; a 10-hp. d.c. motor or a 7½-hp. cage motor of some types could safely be employed.

When checking power requirements by test, it is best to simulate the actual load conditions and, with suitable power measuring equipment and data on the test motor, calculate the power needed.

Sometimes, however, precision test equipment and motor data are not readily available, and some substitute for the ideal condition must be made. To make a simple test system work, certain assumptions must be made. When using the approximate method to be described, it is assumed that the line voltage is close to the rated value and that a standard motor is used. Standard motor means, in the case of d.c. machines, standard, general-purpose, shunt-wound motors. With squirrel-cage motors, it is taken to mean normal-starting-current, normal-torque, open, three-phase, 60-cycle motors.

A decrease in line voltage will mean an increase in motor current for any given load. Therefore, if, in the approximate method described here, the

Power Required to Drive Common Machine Tools

Type of Machine	Size	Horsepower Range
Vertical drill press	12 to 20 in.	1
	50 to 60 in.	5—7½
Radial drill press	3-ft. arm length	3 to 5
	10-ft. arm length	10 to 20
Vertical boring mills	37 to 42 in.	15
	10 to 12 ft.	30 to 40
Turret lathes	12 in.	3
	24 to 27 in.	15
	42 in.	30
Engine lathes	12-in. swing	½ to 2
	24 to 27-in. swing	10 to 15
	60 to 84-in. swing	30 to 50
Milling machines		
Vertical slab mill	24-in. width	7½
	42-in. width	15
Vertical	12 in. under work	5
	20 in. under work	15
Universal	Machine No. 2	5—7½
	Machine No. 5	15 to 20
Planers, double housing	22 in. wide, 22 in. under rail	10
	36 in. wide, 36 in. under rail	20 to 25
	60 in. wide, 60 in. under rail	35 to 50
	100 in. wide, 100 in. under rail	50 to 75
Shears, to cut ⅛-in. iron	30 to 42 in. wide	3
¼-in. iron	30 to 42 in. wide	5
⅛-in. iron	72 to 96 in. wide	5
¼-in. iron	72 to 96 in. wide	7½
Slotters	6-in. stroke	3
	14-in. stroke	5—7½
	30-in. stroke	15

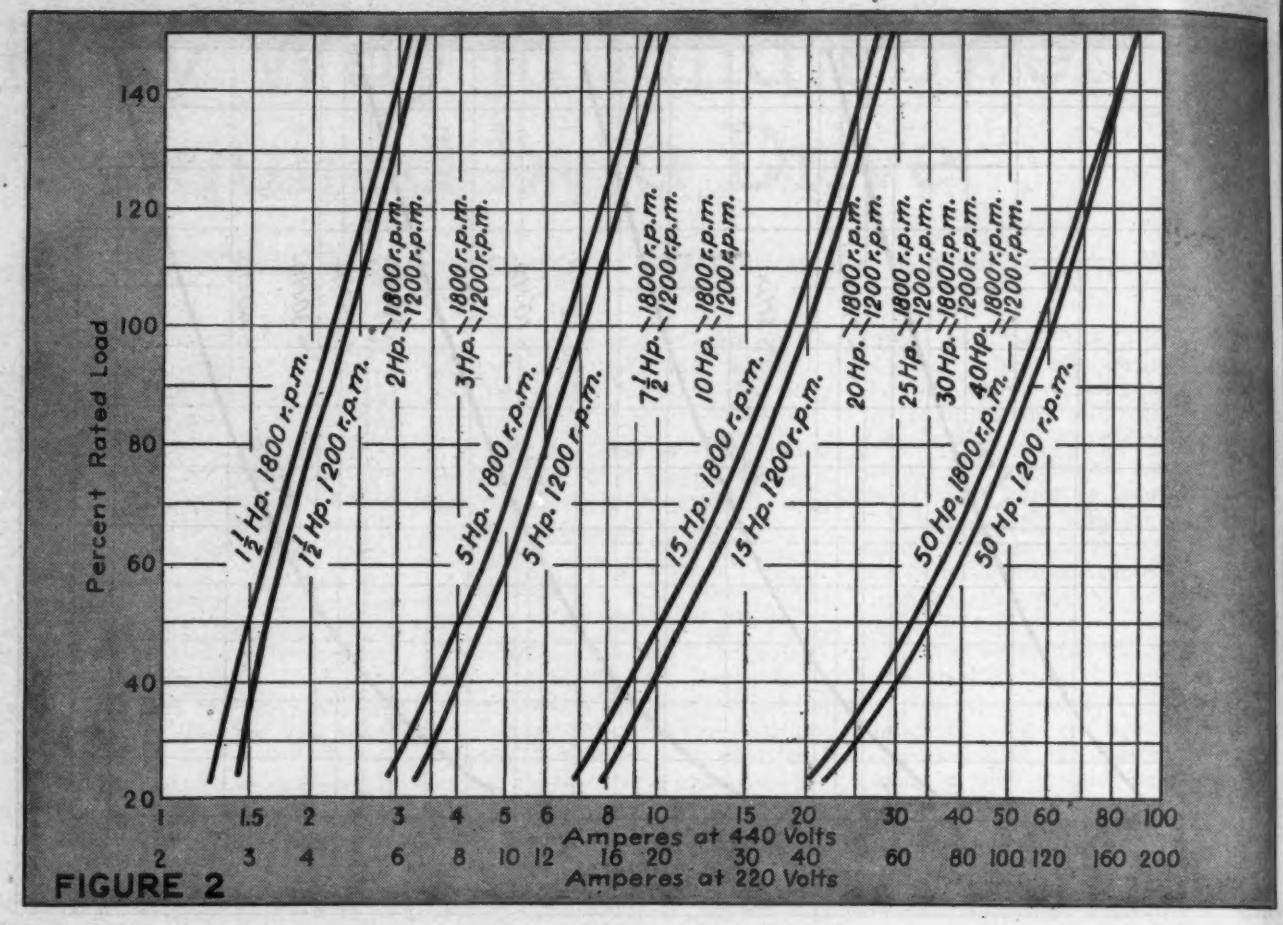


FIGURE 2

line voltage is off by 5 percent, the current will be off by approximately the same amount. The curves are accurate to a value of about plus or minus 5 percent, however, so that slight variations in voltage need not be considered too seriously.

Breaking the test procedure down to its barest fundamentals, it is possible to estimate the power taken by the drive from a standard motor by using only an ammeter.

For d.c. standard motors refer to Figure 1, which gives an approximation of load in amperes. For instance, if we are using a 15-hp., 1150-r.p.m., 230-volt motor to make the test, we may find that the current, with the motor driving its expected load, is 37 amperes. By referring to the curve for 15-hp. motors, we find that the 15-hp. motor is operating at about 68 percent load. This means that the actual loading is about 68 percent of 15 hp., or 10.2 horsepower. Probably a 10-hp. motor would prove satisfactory in operation.

In the event that motors of the ratings shown on the curve are not available as test machines, a close approximation can be made of the current characteristics of any other horsepower rating of general-purpose motors between 1½ and 50 horsepower by interposing curves for the rating available. These curves must be interpolated between the full curves shown; also they must pass through the full-load current point indicated on the curve.

Note that the curves for d.c. test motors are applicable to motors with basic speeds of 1750 or 1150 r.p.m. Basic speed is the speed obtained with full rated field at rated load. The characteristics of d.c. motors have not been standardized; therefore the values given may vary considerably with machines of different manufacturers. For rough approximations, however, the curves should prove satisfactory.

Squirrel-Cage Motors

With squirrel-cage test motors, the procedure is similar to that used with d.c. machines. Voltage balance between phases is an important item to consider in an a.c. supply. If unbalance is suspected, three ammeters are necessary. The current in all three lines should be read and an average of the three values used.

Figure 2 shows the approximate current drawn by typically rated squirrel-cage motors at 220 and 400 volts. The current is given for 1200-and 1800-r.p.m. motors. Therefore, these curves are not applicable to machines of lower rated speeds. If motors of ratings other than those on the curve are available, their current characteristic can be plotted in the same way as was indicated for d.c. motors.

When using these methods of estimating power requirements it is necessary first to make a rough estimate to determine the probable rating required. For example, the 15-hp., 1800-r.p.m., squirrel-cage motor curve covers a range in horsepower from 25 percent of 15 horsepower or 3.75, to 150 percent of 15 or 22.5 horsepower.

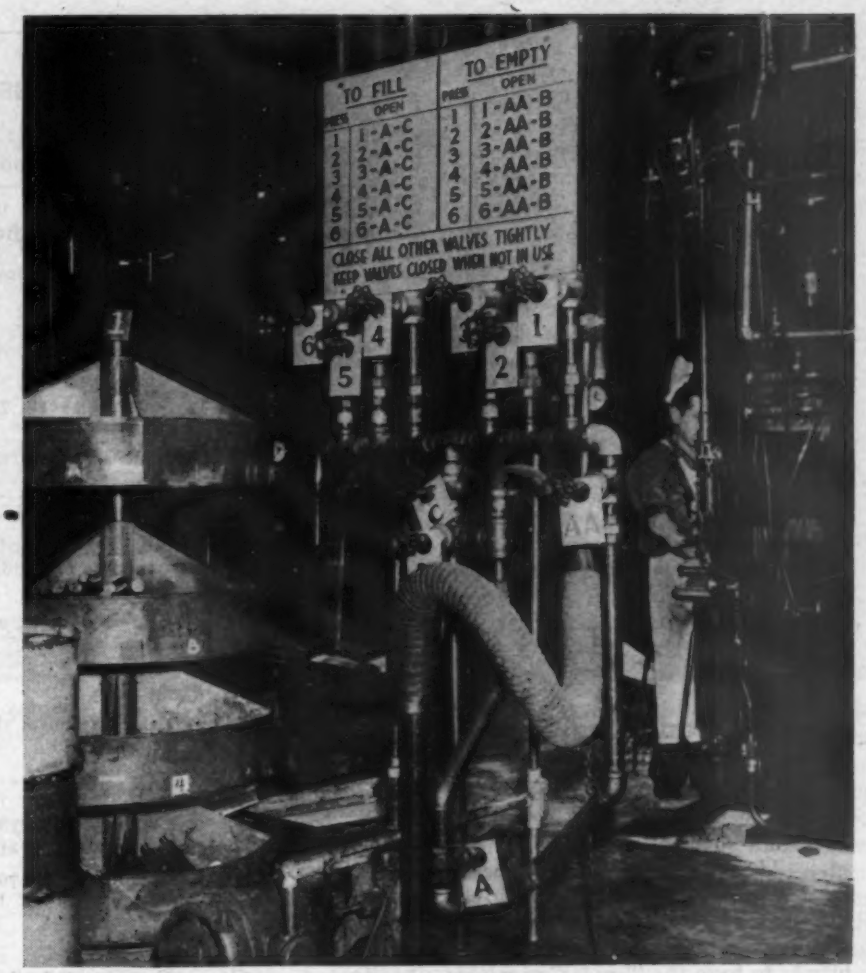
The ampere-load curves give values of current for 1½-, 5-, 15-, and 50-hp. motors, covering a total range in horsepower of 0.375 to 75 horsepower.

The accompanying table gives data taken from the "Standard Handbook for Electrical Engineers" which will be helpful in making rough approximations of power requirements. It shows the recommended motor ratings for driving various types of common machine tools. The values given are for general service only. If the machine is to be used consistently on very light or very heavy duty, the horsepower figures shown may be considerably in error. It is advisable to check the power requirements by actual test.

Planned Lubrication Saves Men and Machines

C. L. McBRIDE, Plant Engineer, Curtiss-Wright Corporation

How six men keep all machines running at the big Curtiss-Wright plant. The answer is centralized lubrication, careful planning, and the right records



Hydraulic press reservoirs are completely serviced by piping to pump unit at remote point, where central header and valves control the make-up and oil-changing operations of the machines

TWENTY-EIGHT MONTHS of careful study and testing provided the groundwork for the lubrication plan and methods that are showing outstanding results at the Curtiss-Wright Buffalo plants. In a previous article ("Centralized Oiling Keeps Vital Machines Running," FACTORY, November, 1943), a preview was given of the workings of the centralized lubrication system applied to more than 300 machines in the machine shop and press departments. This present article deals with the development of the lubrication program for the entire plant, and describes further specific improvements made as a result of this intensive study.

The first step in attacking the lubrication problem was a careful survey of the existing conditions. Representatives of machine manufacturers and oil companies submitted their recommendations. From this information a chart was compiled, showing the equipment to be lubricated and the recommendations of the lubricant consultants. To these recommendations the group in charge of the project added ideas of its own, drawn from its practical experience.

Analysis of the chart of recommendations showed that too many different oils and greases were recommended. It was therefore necessary to reduce the total number to a bare minimum that would still be consistent with good lubrication practice. The selected lubricants were then grouped as to types of oil or grease, and a code color was assigned to each group. These code colors were further broken down by an additional identifying numeral for each grade within the group, which obviously could also be correlated with specific service applications.

Selection of the basic code colors was made only after careful study. Colors that are widely separated in the spectrum were used so that aging of the color, dirty oil cups, or different types of fluorescent lighting could not possibly cause them to be mistaken for one another.

The results of this extended survey are given in the chart on page 142.

In presenting this chart, it is not the intention to offer a standardized set-up that will provide the answer to all cases. This is the selection and grading that is working exceptionally well for Curtiss-Wright. Moreover, since there are many thousands of types and grades of industrial lubricants on the market (one manufacturer offers over 1500), many of which are designed for special uses, it is felt that no broad plan of standardization can be laid down that will be practicable for all industries.

In accordance with this chart, lubri-

cants that are purchased on specification from several suppliers lose their brand identity upon entering the oil house and assume a code color and number. In addition to those on the chart, there are seven special lubricants for very limited applications that are marked for exact use.

Carrying the plan to the next logical point, each machine has been similarly color coded and numbered at every point of lubrication. More than 7000 number plates have been riveted to machines to designate the exact lubricant required.

Having thus simplified the lubrication requirements and also assured the use of the correct lubricant to every bearing point, the second major step in the program was the installation of better lubrication methods wherever possible. For instance, the result of the machine survey showed, in addition to the more than 300 machines connected to a centralized lubricating system, the press and cutting department contained another large group of machines that could benefit by some form of centralized lubrication. A large percentage of the equipment of the press division of this department consists of single-crank and double-crank power presses. The survey indicated that in addition to the slides, each single-crank press has five bearings and each double-crank press has eleven bearings, all of them requiring regular and frequent lubrication.

Press Headaches Gone

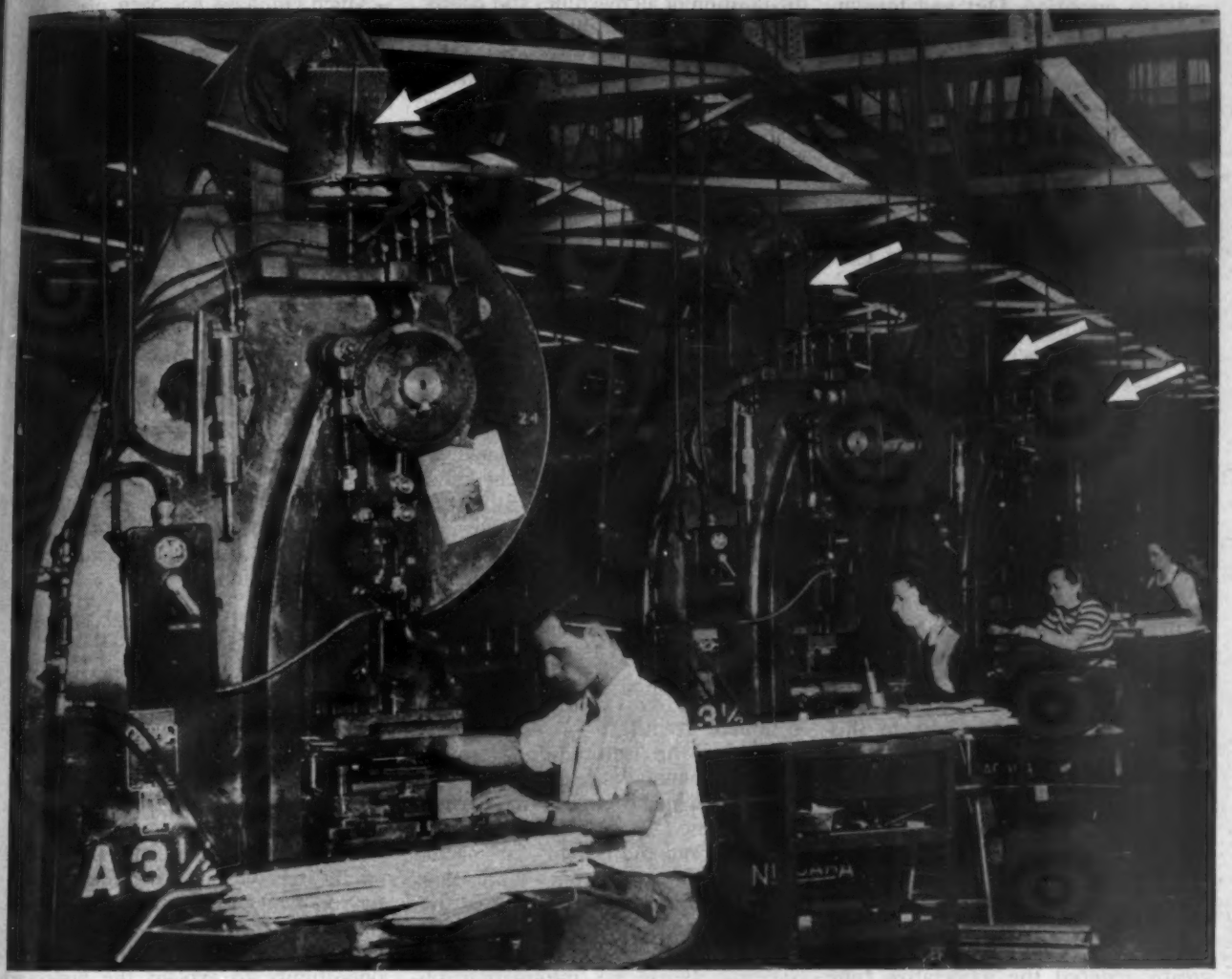
It was decided to install a reservoir gravity-feed type of oiling system on each of these presses, employing materials not affected by prevalent shortages. The ultimate design consists substantially of a standard 2-gal. tin can, an oil-level gage that is a piece of plastic tubing, and standard pipe-fittings to form the "header" to which are attached a series of sight-feed oilers. These drip oilers control the feed to each individual bearing and slide. An additional feed line is connected from the tank outlet to a hand compressor firmly bracketed to the side of the press. The discharge line from this compressor leads to another header that joins the lower end of each drip feed, and from that point down a single tube leads from each drip feed to the lubrication point. Incidentally, on the double-crank press both crank bearings are also connected to the header system by flexible oil-resistant synthetic rubber hose.

It was found highly advantageous to include the hand compressor in this set-up to obtain a means of flushing the bearings. Power press bearings operate under abnormal bearing conditions. Each revolution of the crank imparts a distinct shock to the bearing, which tends to force the oil out from the ends of the bearing. If this lost oil is not replenished often, and even when it is, small particles are rubbed from the bearing surfaces. These particles are prone to attract one another and collect at some point in the bearing, causing oil to be diverted from this area. If enough heat develops at this point, the wad of soft bearing metal will fuse itself to the shaft and rotate with it, cutting into the entire circumference of the bearing. The function of the hand compressor is to flush each bearing at periodic intervals to prevent these accumulations and also to remove any foreign matter that may have sifted into the open ends of the slow-moving bearings.

During regular press operation, the

Lubricant Classification Chart

Color Code	Grade No.	Type	Service Application
OILS (viscosity given in Saybolt universal viscosimeter readings at 100 deg. F. unless otherwise specified)			
Red	5	Hydraulic mineral oil, vis. 110–150 sec.	Hydraulic systems, circulating systems with close clearances
Red	6	Same as above, vis. 150–225 sec.	Same as above
Red	7	Same as above, vis. 250–325 sec.	Circulating systems
Red	35	Same as above, vis. 550–600 sec.	"X" hydraulic presses
Red	38	Same as above, vis. 1000 sec.	"Y" hydraulic presses
Blue	9	Mineral oil with varying amounts of additives, vis. 200–250 sec.	Machine oil
Blue	10	Same as above, vis. 275–350 sec.	Lathe headstocks, aprons (hand oiling), suitable for moderate speed if plentiful supply
Blue	12	Same as above, vis. 105 sec. at 210 deg. F.	Heavy machines, small loaded gear units, heavier plain bearings, and slides. Not for ball or roller bearings
Blue	28	Compound heavy machine oil, vis. 105 sec. at 210 deg. F.	Press slides, heavily loaded ways and bearings
White	15	Spindle oil, vis. 70–100 sec.	High speed precision machines with little clearance. Ball and roller bearings where level can be maintained
Brown	26	Concentrated oil. Very rich lubricating, high-heat resisting. Great film strength	Large electrical equipment, motor-generators, frequency converters. Heavily loaded or overheated bearings
GREASES			
Yellow	1	Lime-base soap, general purpose, high pressure, semi-fluid. Melting point 180 deg. F.	Plain bearings, slides, and cams
Green	2	Soda-base soap, with non-corrosive. Melting point 300 deg. F.	Ball and roller bearings
Orange	3	Water pump	Packing glands for water and oil pumps
Black	4	High temperature with fillers — graphite, mica, asbestos. For bearings operating over 300 deg. F.	Oven doors, etc.
Aluminum	23	Heavy gear lubricant	Worn gears and heavy tooth pressure



Reservoir lubrication on each power press has enabled entire department to give two years of three-shift service without a single overhaul. Periodic flushing by auxiliary hand pump is a vital factor

drip oilers take care of the lubrication requirements. The flushing operation is done once each day and is accomplished by releasing the dog that normally holds the spring-loaded plunger of the compressor in the retracted position. The charge of oil that has accumulated in the compressor cylinder during the previous day is thereby forced by the plunger through all the bearings. This oil is kept from forcing back up through the drip oilers by small check valves that are actually standard ball-check oil fittings with the ball-check springs removed. If for any reason it is believed that pressure additional to normal plunger pressure is needed to remove any injurious particles, the compressor auxiliary lever is worked at the same time, building an exceedingly high pressure on the flooding oil, which will dislodge any abnormal deposit in the bearings.

Surprisingly, it was found that the entire cost of materials and installation of this reservoir unit was only about $15 per machine and that it was possible for two maintenance mechanics to equip four to five machines a day. Conclusive proof of the value of this lubrication method is demonstrated by an examination made of the bearing surface of the slides of one of the double-crank presses which, after more than two years of continuous service, still showed the original surface tooling marks!

Squaring Shears, Too

In the press and cutting department there are a wide variety and large number of squaring shears that have also been similarly equipped with oiling connections leading to all slides and bearings. On the large shears it was found desirable to use a reservoir on each end to overcome the tendency of air locks to form in the long connecting header that would not allow the oil to reach the drip feeds. Because of the hard and continuous wear to which these shears are subjected, under ordinary conditions it would have been necessary to oil the moving parts at least three times each shift, or nine times a day. Now, however, the busy operators can completely forget this important oiling job, because it is automatically and continuously taken care of without any attention on their part.

Experience has shown that each of the 2-gal. reservoirs holds sufficient oil to lubricate the power presses and squaring shears for six to eight weeks, which includes the daily flooding operation of the power presses.

The feature of obtaining continuous lubrication by this installation, even when a machine is shut down for short periods, is probably the greatest factor in adding life to the bearings and slides. By this method the machine is also well lubricated at the start of operations.

Hydraulics Now Behave

Hydraulic presses, both large and small, can become temperamental and

erratic in operation. Dirt and foreign material in the reservoir will sooner or later foul the operating valves and cause shutdowns until the trouble is located and remedied. The reservoirs of these presses range in capacity from approximately 75 gallons of hydraulic oil in a small press to about 2000 gallons in a giant press.

Since the battery of the hydraulic presses located in the press and cutting department consumes about 50 to 55 gallons of hydraulic oil each week, the adding of make-up oil became a routine operation. Production was interrupted whenever the make-up oil was put in the reservoirs. The greatest difficulty, however, came when the reservoirs were periodically drained and flushed. Valuable production time was lost and at times the operation nearly flooded the department floor.

The practical solution was the piping of all outlets of these reservoirs to a central header and pump unit located at a remote point easily reached from the service aisle. Hydraulic make-up oil can now be pumped into any reservoir from barrels that have been brought to this location on a factory truck. Likewise, any single reservoir can be similarly drained and periodically flushed by the same installation.

One-Man Maintenance

The ability to service these machines from this remote point has greatly reduced the inoperative time of these machines due to service interruptions. More important, however, is the fact that operational troubles with these hydraulic presses have been practically eliminated. The fact that the fresh oil is pumped directly from the original containers to a reservoir without handling in the open has eliminated any chance of foreign material fouling the fresh oil and causing trouble. This is true also when make-up oil is added.

The efficiency of these lubrication and drainage systems in the press and cutting department is more clearly emphasized when it is known that the entire department is completely serviced by only one maintenance mechanic, who appears in the department at 7:30 each morning and is ready to leave—with all machines attended to—by 10, just 2½ hours later.

Only secondary in the attainment of these achievements, and of corresponding value, is the place of record-keeping in the entire program of plant lubrication. To facilitate the record-keeping, charts have been compiled that are miniature floor plans showing the position of all machines and equipment requiring lubrication. On these charts are specific directions, and spaces for noting anything unusual that may require attention. By using these charts the maintenance mechanic trusts nothing to his memory, and, if he follows them in detail as laid out, each piece of equipment requiring lubrication or attention will be covered with a minimum of travel.

Lubrication Calendar

The periodic draining and flushing of the machine reservoirs is recorded on a type of perpetual calendar and filed in such a manner that the dates automatically come up when machines again require attention. By scheduling the work in this manner, it is possible for supervision to plan in advance for the best time when the production of the machine will be least affected by the draining and flushing process.

The record of the completed work also constitutes a permanent listing of the date and amount of work done at that time. This provides a valuable complete record, or "case history," for either the factory supervision or the next maintenance mechanic who may be assigned to service that particular machine.

Aside from the benefits that accrue mechanically from proper lubrication, there is a large saving in required personnel through the installation of the centralized and reservoir lubrication systems. Based on information obtained from plants having similar production equipment without benefit of these lubrication methods, it is estimated that a total of 35 or 40 men divided over the three shifts would be needed to care properly for the lubrication requirements of this plant under what might be considered "normal" conditions. At present the entire lubrication program of this enormous plant is cared for—and in an efficient manner—by only six men, and the supervisor is included in the six!

No Overhaul in Sight

The mechanical benefits are difficult to evaluate. Normal conditions would have already called for an "overhaul" of the press department equipment, yet, after two years of continuous three-shift service, no such overhaul has been made or is even in sight. Bearing trouble has always been accepted as a necessary evil in power presses, but since the reservoir lubrication has been installed, not one bearing has failed or has been replaced—certainly a pertinent point in days of hard-to-get replacement parts.

Much emphasis has been placed on the mechanical methods and equipment that have made this outstanding record possible. Equally important, however, is the human element and to this point considerable attention is being given. The education of the men is recognized as important in carrying out the correct lubrication of the machines. If the basic reasons for following a certain procedure are thoroughly understood, better all-round results are obtained.

Classes are held twice a month to familiarize the personnel of the lubrication staff with the machines and equipment on which they will work as well as with the methods and products that they will use. These classes are not limited to the immediate working personnel but include machine repair mechanics and laboratory men who may be interested in the subjects under discussion.

Movies for Training

Liberal use is made of motion pictures, slide-films, and charts. Pictures of unusual conditions encountered within the plant are projected and discussed. These pictures provide valuable assistance in training new members of the working staff.

Outside speakers are also prominent on the schedule and include authorities on many subjects. Factory representatives and service men for machines used in the plant have an opportunity to explain the approved methods of servicing their equipment. Bearing manufacturers bring detailed information as to the proper service and adjustment of their products. Oil companies have been most cooperative in providing information on practically every type of lubricant and its application in the field.

On several occasions the lubrication class has toured the plants of equipment manufacturers to see at first hand how the machines are first assembled and then adjusted for correct operation.

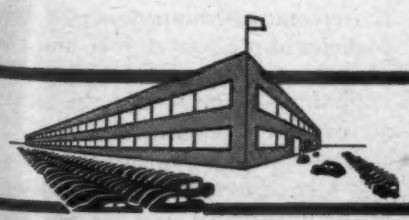
Unquestionably, the enormous investment in production machines of all types is being protected by this comprehensive program. Depreciation and replacement of parts are being remarkably reduced. The important job of making "what we have" last longer is being accomplished. From a production angle, the plan is equally beneficial. Accurate machines are essential in the production of accurate aircraft parts. Proper lubrication of these machines is insuring that they will remain accurate and will continue to produce quality parts in quantities that truly hasten the arrival of V day.

A message to America's millions of war workers

KEEP YOUR TIRES IN THE WAR

There are few more tires for passenger cars in stock. 30,000,000 new tires will be needed this year to keep essential cars in operation. The tire industry simply won't be able to make that many while it meets military demands and bus requirements.

Yet 80 percent of the nation's war workers depend upon passenger cars for transportation. These *home-front soldiers* must do a better job than ever in conserving their tires. Upon the product of their work in the plants depends the success of the *fighting-front soldiers.*



THIS ARTICLE HAS BEEN PREPARED FOR DISTRIBUTION TO WORKERS. FOR QUOTATION ON REPRINTS, ADDRESS THE EDITOR

Save Rubber by Driving Carefully

Keep Speeds Low

TREAD WEAR increases rapidly as car speed goes up. For example, at 70 miles an hour treads wear down twice as fast as at 45 miles an hour. And wear at 35 miles an hour, the limit imposed by government regulation, is less than at 45 miles. Trading tires for time must not be done.

Slowing down to a few miles an hour when turning corners or going around sharp curves is another good way to prevent unnecessary wear and tear on tires. Also, it makes for greater safety in driving.

Treat Tires Gently

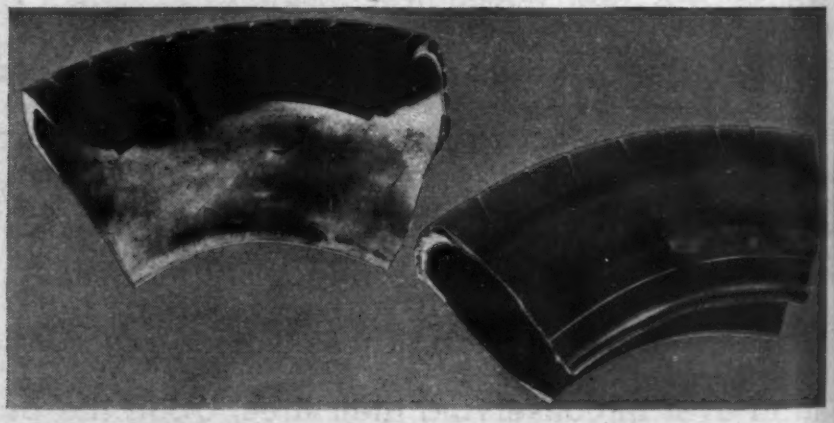
SERIOUS DAMAGE can be done by allowing a tire to hit holes, curbs, or other obstructions, with sufficient force to crush it against the rim. Under-inflation makes a tire more subject to damage in this way, but proper inflation will not necessarily prevent damage from such abuse.

A rim bruise usually leaves no mark on the outside of the tire, but the result is broken cords. As a rule, the break appears on the inside. The tire injured in this way does not often go flat at once because the tube is not damaged. Nevertheless, every time the injured spot bears the weight of the car, as the tire turns, the break opens. Then it closes when the weight of the car is taken off. The continuous opening and closing of the break cause it to increase in size. In time the tube is forced into the opening. Then it is pinched through and goes flat.

Fortunately, rim bruises usually can be repaired satisfactorily.

Scraping the sides of tires against curbs is another common form of abuse that shortens tire life. The rubber on the sides of tires is much thinner than the tread. When it is scraped through, the fabric is exposed to dirt and moisture and begins to deteriorate.

HOW A RIM BRUISE IS CAUSED



DOUBLE OR COMPOUND RIM BRUISE

AN OUTSIDE RIM BRUISE

Start and Stop Slowly

SPLIT-SECOND STARTING and stopping may look snappy, but this appearance is bought with rubber that is precious and scarce.

It is the friction between tires and roadway that permits a car to be started rolling and stopped. If acceleration is so rapid that this friction is overcome and slippage occurs, tiny particles of precious rubber, and lots of them, are torn off the tread. The same thing happens when the brakes are jammed on too hard.

A few extra-snappy starts and stops may take off as much rubber as miles of driving at 35.

Prepared with the cooperation of The Rubber Manufacturers Association, Inc., New York.

Go Easy On the Brakes

HEEL-AND-TOE WEAR

USE OF BRAKES more frequently than necessary is a common fault that tends to increase tread wear. So does its companion practice—hard application. Let the engine do as much braking as possible. It provides an effective but gentle means of reducing car speed to a few miles an hour. Then the brakes can be used to bring the car gently to a stop.

Use of a little forethought when driving—to recognize places where the car must be slowed down or stopped, and to keep out of tight spots—will cut down use of the brakes, also tread wear.

High-speed driving and excessive use of brakes cause a form of irregular tire wear in which one end of each tread block is worn down more than the other. The end that wears down faster is the one that first grips the road when the brakes are applied. Heel-and-toe wear, as it is called, is more noticeable on the front tires.

Conserve Tires by Proper Care

Keep Tires Properly Inflated

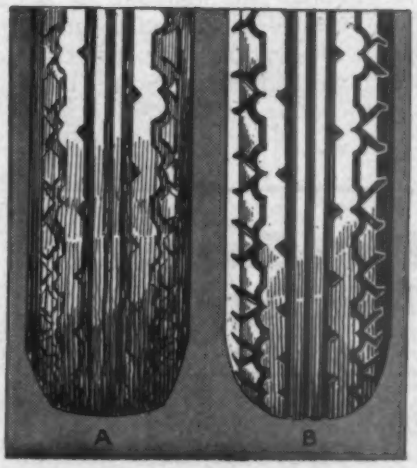
THE LOAD on a tire is carried by the air which it contains. A flat tire has no load-carrying capacity.

When a tire is inflated to the recommended pressure, the cord or fabric body can withstand without injury the slight flexing to which it is subjected. When the air pressure is allowed to drop, flexing and chafing increase, and the tire is on the way to the scrap heap. An excessive amount of heat is generated, and the cords on the inside of the tire become loosened or broken and chafe through the tube.

Maintenance of proper air pressure will prevent development of this condition. In addition, a tire that is properly inflated is much less likely to suffer rim bruises, referred to previously.

Common causes of low air pressure are: Neglect to inflate tires regularly; a slow leak, resulting from a puncture; and slow leakage through the valve caused by failure to replace, or by loss of, the valve cap, or by dirt in valve core.

A tire under-inflated 30 percent will give only about three-fourths of the mileage built into it.



A. UNDER-INFLATION MEANS ABNORMAL WEAR. B. PROPER INFLATION—NORMAL WEAR

Change a Flat Tire at Once

WHEN A FLAT or almost deflated tire suddenly shows up on the road, temptation to drive on to a service station or some more convenient place for changing the tire may be strong. Yielding to that temptation may mean quick execution of the death sentence on both tube and tire. Running a tire with little or no air in it quickly results in damage ranging from slight chafing to broken cords and ply separation. Usually both tire and tube are damaged beyond repair.

AFTER RUNNING FLAT

CONTINUED ON NEXT PAGE

Be Sure to Replace Valve Caps

VALVE CAPS serve to prevent the entrance of dirt and water. Road water tends to corrode valve bodies. Dirt that works its way, or is blown, into a valve is likely to prevent tight sealing. The resultant slight leakage produces a chronically under-inflated tire. And under-inflation means rapid deterioration and shortened tire life.

Have Cuts Repaired Promptly

A LARGE PERCENTAGE of tire failures are caused by cuts. Many of these failures could be prevented if the cuts were properly repaired at once.

When a cut that does not go all the way through the tire is neglected, the tread will in time separate from the cord body. Eventually there is a blowout that cannot be repaired. These results are caused by water, dirt, and pebbles being forced through the cuts and lodging between the cord body and the tread. Under the continuous flexing action set up when the tire is in use, these foreign particles abrade the cord body and undertread. Rubber is ground off inside and lodges around the cut, causing a bulge in the tire. Breakage of the cords soon enlarges the original cut. In a comparatively short time a blowout takes place, or the rupture becomes so large that a permanent, satisfactory repair is impossible. Then many miles of service are transformed into a few pounds of scrap rubber.

CUT THROUGH TREAD AND PLIES

A NEGLECTED CUT

Mount Tires and Tubes Correctly

PUTTING A TIRE and tube on a rim is not a complicated matter. On the other hand, there is more to it than blindly pounding or forcing these parts into place. Neglect of a few simple precautions that consume little time may result in serious damage to both tire and tube.

With drop-center rims the procedure is:

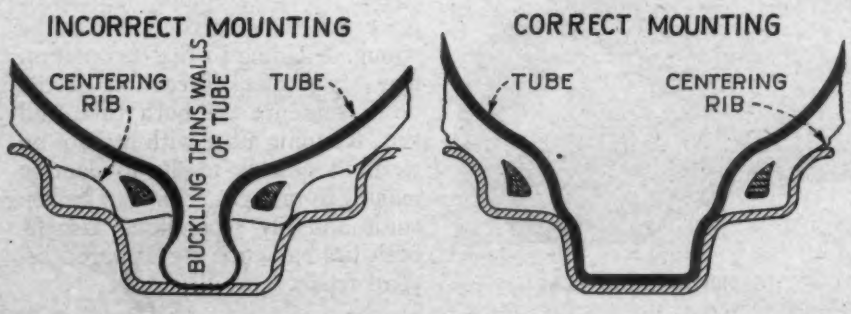
1. Inflate tube until barely rounded out. Insert in casing with valve stem at red dot on tire.

2. Apply first bead, pushing a portion of the bead into the bottom of the well and forcing the remaining portion over the flange. Do not use tools longer than 16 inches.

3. Insert valve through hole in rim and pull from outside until base is against inside surface of rim.

4. Starting opposite the valve, apply the second bead by forcing a portion down to the well. Work remainder of bead over the flange in short steps. Alternating from left to right will prevent the tire from creeping around the rim. Do not attempt to force a large portion of bead over the rim at one time. To do so may

BUCKLING OF TUBE FROM IMPROPER MOUNTING



result in damaging the bead wires.

5. Raise beads out of the well. See that both beads are properly seated on the rim ledge. If the tire has centering ribs, make sure that they show evenly all around over the rim flange.

6. Pull the valve out by hand, center it, and make sure that the base seats firmly on the inner surface of the rim.

7. Hold the valve in this position and inflate tube until both tire beads are correctly seated.

8. Deflate tube completely, to permit tube to readjust itself. Then reinflate to the recommended pressure.

9. Never use oil on tire beads. Vegetable oil soap or paraffin may be applied to the inside and outside of beads, to facilitate mounting.

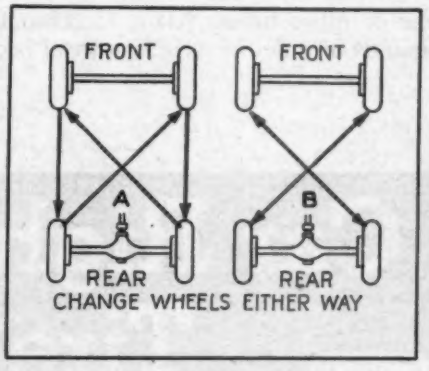
Give the Spare Tire Exercise

AN IDLE TIRE deteriorates quite rapidly. Hence it is a mistake to reserve one tire permanently as a spare. In the long run, better mileage will be obtained by letting each tire in turn serve for a time as a spare, or by putting the spare back into service at intervals. Ordinarily every 5000 miles is a suitable period.

Rotate Tires Every 5,000 Miles

THE FOUR TIRES on a car do not all wear down evenly, or in the same places. For example, front wheel camber causes tires on these wheels to wear more on one side than the other. Again, the side thrust from rounding turns causes wear on the side of the tread of the front wheel tires. Misalignment, worn or loose bearings, bent axles, wheel assemblies out of balance, and various other conditions cause uneven tire wear. When excessive wear is caused by abnormal conditions, they should be corrected by a good mechanic.

Greater mileage will be secured if wear is spread as evenly as possible over the tread surface. This can be accomplished by changing wheel positions at least every 5,000 miles. Tires moved from front to rear continue the same direction of rotation. When tires are moved diagonally from rear to front, or vice versa, the direction of rotation is changed.



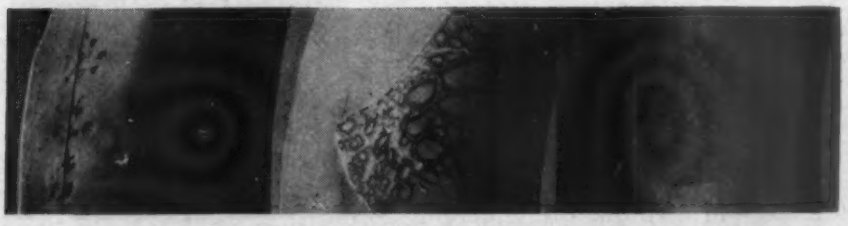
IF TIRES WEAR ON BOTH SIDES OF TREAD, CHANGE WHEELS EITHER WAY

IF TIRES WEAR AT ONE SIDE OF TREAD ONLY, TURN THEM AROUND

Keep Dirt Out of Tires

IF ANY FOREIGN MATERIAL gets between tube and casing, a chafing action is set up which in time will cause serious damage and ultimate failure of one or the other, or both. Dirt or foreign matter, of course, is most likely to get in when a tube and tire are being assembled on the wheel. Therefore, take good care to see that this does not happen. Before inserting the tube be sure that it and the casing are clean.

Do not use soapstone too liberally. An excessive amount will tend to cake in one or more spots. Then it will be just as harmful and destructive as any other foreign material.



DAMAGE CAUSED BY HARD SUBSTANCE BETWEEN TUBE AND TIRE

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Match Tubes and Tires for Size

SINCE TUBES become thinner, "grow," and deteriorate generally after long service, it is advisable to change tubes and tires at the same time.

In particular, a tube should never be used in a tire that is larger than it was designed for. An undersized tube will stretch excessively, result in a thinner wall and abnormally rapid loss of air. It will have less than normal resistance to chafing, tears, and punctures. There will be abnormal strain on the valve base. The unusually rapid loss of air commonly results in chronic under-inflation, which markedly shortens tire life. Deterioration of the tube rubber is hastened by the excessive stretch which the tube undergoes.

Keep Tires Free From Oil and Grease

OIL AND GREASE are distinctly harmful to rubber, causing it to soften and swell. Care must be taken, therefore, to keep tubes and tires from exposure to these substances. Do not drive through puddles of oil, or allow the car to stand in them. If oil gets on the tires, it may be removed with a rag wet with gasoline or other solvent.

Have Smooth Tires Recapped

THIS PROCEDURE offers the only hope of keeping many thousands of trucks and automobiles in service during the coming months. Larger supplies of synthetic rubber are now available, but because of the shortages of manpower and the huge demands on their productive facilities, tire manufacturers simply are not able to produce enough new tires to meet both military requirements and the growing civilian demands.

Tires that are in good condition, save for a smooth tread, can be recapped one or more times. Many more thousands of miles of satisfactory service can then be obtained from them at minimum cost in materials and manpower.

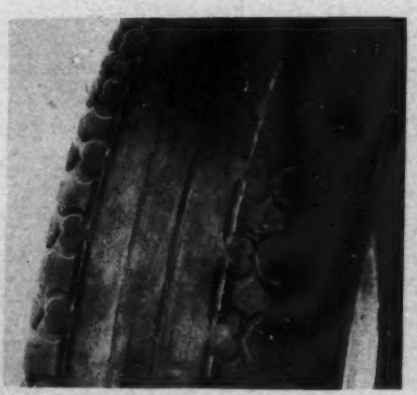
A tire whose tread has been worn through, and the fabric damaged, cannot be made serviceable by recapping. This is true also of tires whose fabric has been seriously damaged by neglected cuts, running under-inflated, or in other ways.

Have tires recapped as soon as the tread becomes smooth.

Keep the Car Right for Longer Tire Life

See That Wheels Are Aligned

EXCESSIVE TOE-IN or toe-out, usually of the front wheels, is the most common and most destructive form of misalignment. In this condition, steering will keep one tire running straight, but the other will be



TOO MUCH TOE-IN OR TOE-OUT

OTHER MECHANICAL DEFECTS

dragged sidewise. If a wheel is ½ inch out of alignment, the tire will be dragged sidewise 87 feet in a mile. And every inch of sidewise travel grinds off rubber.

Inspect tires frequently. When uneven or rapid tread wear is noticed, have a competent mechanic check wheel alignment.

Keep Wheels Properly Balanced

When a wheel is in balance, the weight of the wheel and tire assembly is equally distributed around the axle.

An unbalanced wheel produces several highly objectionable effects, such as "tramp" or road shocks, high-speed shimmy, and rapid, spotty tread wear. Such wear may appear as cupping or excessive wear in one spot, or as ripples, a series of cuppings around the circumference of the tire.

A well-equipped service station can quickly find the cause of wheel unbalance and remedy it.

MISALIGNED WHEELS CAUSED THIS EXCESSIVE WEAR

THESE RIPPLES WERE CAUSED BY UNBALANCED WHEELS

Watch Condition of Rims

Rims may be damaged by striking a stone, curb, or other obstruction with sufficient force to bend the flange down and away from the tire bead. When this happens, the pressure in the tire forces the bead out beyond its natural circumference, where it is deprived of the support of the rim flange. An unnatural chafing and flexing action takes place, which destroys the bead reinforcement and results in a blowout.

A bent rim usually can be straightened. If not, it is good economy from every standpoint to put on a new rim.

BENT RIMS CAUSE BEAD FAILURE, RESULTING IN BLOWOUTS

Maintain Proper Brake Adjustment

This is another must in any tire conservation program. When brakes are in good condition and correctly adjusted, the work of stopping a car is distributed equitably among all the tires. Defective conditions, such as worn linkages or cams, brake drums out of round, or grease or oil on drums, tend to throw most or all of the burden on two or three tires. Hence they are subjected to abnormal wear and tear. And, of course, a serious accident hazard is introduced.

Have brakes tested and adjusted twice a year.

Make Sure Running Gear Is Okay

Various mechanical defects in a car may show up in abnormal or uneven tire wear. Among such defects are: Worn or loose bearings; worn bushings; loose steering gear; bent axles; wobbly wheels; or a twisted frame. Tire conservation, to say nothing of safety in driving, requires that these and any other defects present be promptly remedied.

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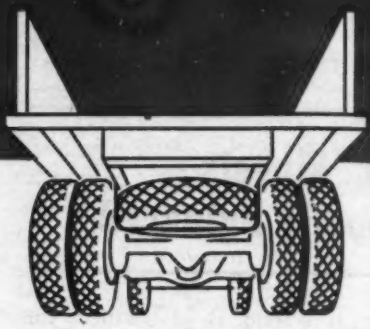
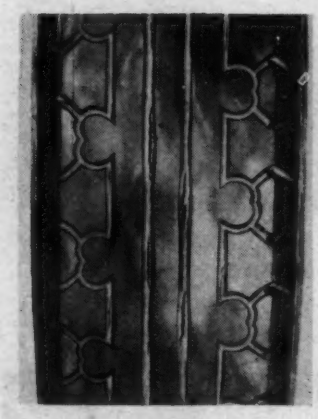
Rules for Truck Tire Treatment



The preceding principles of tire conservation apply to trucks as well as to passenger cars. But truck tires may be subjected also to the following harmful practices and conditions:

1. Over-Inflation Brings the Troubles Pictured



TREAD CRACKING

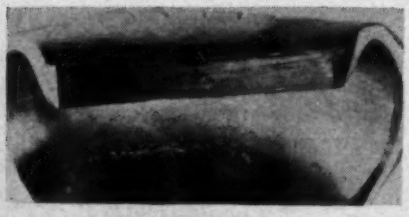
BROKEN RIM FLANGE

A CROWN BREAK

A BRUISE BREAK

2. Overloading Causes Flex Breaks

Such breaks result from overworking the cord body. They occur on the side as well as the shoulder of the tire and run with the circumference.



SHOULDER BREAK

LOWER SIDEWALL BREAK

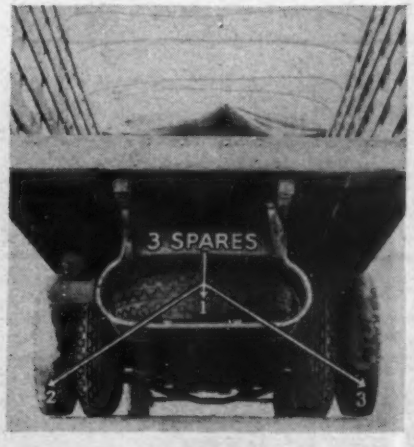
3. Heavy Impacts Break Cords

There may be no sign of injury inside or out. Broken or weakened cords slowly pull apart, however, and other cords break. Then a blowout occurs.

DIAGONAL BREAK CAUSED BY A SHARP IMPACT

4. Mis-Matching Duals Causes Overloading

Broken-down fabric and increased tread wear follow the overloading caused by a new and a worn tire on the same wheel, since one tire does all the work.



OVERLOADING RESULTING FROM MIS-MATCHING DUAL TIRES

Motors and Controls for Hazardous Areas

C. W. FALLS, Engineer, Motor Division, General Electric Company, Schenectady, N. Y.

There are suitable motors and controls for most areas subject to fire or explosion

THERE ARE SEVERAL WAYS of meeting the problems of motor and control application that flammable gases, vapors, and dusts bring up. Some of these ways are: (1) Remote location of motors and controls; (2) isolation through use of special walls or rooms; (3) use of explosion-proof and dust-explosion-proof equipment; (4) use of inert-gas-filled motors; (5) use of pipe-ventilated motors.

Where gases, liquids, dusts, and fibers are merely corrosive, abrasive, or in other ways harmful to electrical equipment, they may be met successfully by the use of standard enclosed equipment. If these meterials are flammable, they may constitute a hazardous condition.

In general, the National Electrical Code classifies hazardous conditions involving flammable gases or vapors as Class I locations and those involving combustible dusts as Class II. Since flammable or explosive gases and vapors vary widely in their explosive properties, it has been found desirable to subdivide Class I locations into four groups, approximately according to their explosion hazards.

Group A. The most hazardous, representing explosion properties on the order of those of acetylene.

Group B. Includes gases and vapors represented by hydrogen.

Group C. Involves hazards on the order of ethyl-ether.

Group D. Includes hazards on the order of high-test gasoline. This is the most commonly met group in industry and includes such materials as acetone, alcohols, benzine, benzol, kerosene, lacquer solvents, methane, naphthas.

Similarly, the National Electrical Code subdivides Class II hazardous dust locations into groups approximately according to their hazard:

Group E. Metal dusts such as magnesium and aluminum, which may be found where such dusts are being manufactured or where parts are being machined or ground.

Group F. Coal and coke dusts, although unusual conditions causing certain concentrations of these dusts in air are usually necessary to constitute a hazardous location.

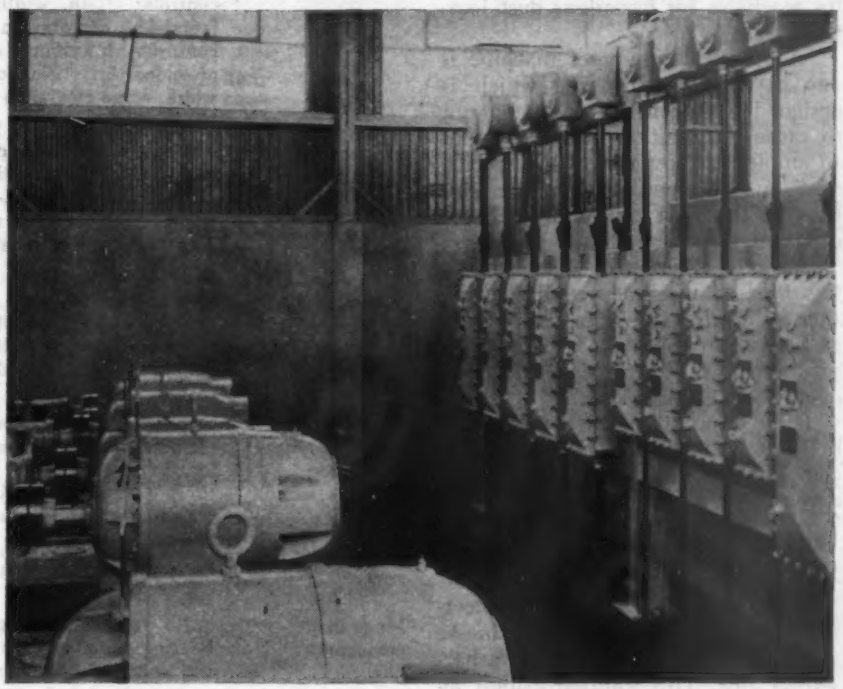


Figure 1. These Class I, Group D, motors and magnetic switches are in a condensate-recovery, gas-cycling and repressuring plant

Group G. Grain dust or similar dust such as flour, or starch, as found in parts of flour mills, feed mills, grain elevators, and similar establishments.

Plants manufacturing or handling ammunition and military explosives usually have conditions not contemplated by the N. E. Code classifications. This is particularly true of areas where black powder, smokeless powder, or dust from TNT and other explosives are released.

Considerable skill and judgment are required to determine the class of hazard, particularly the extent of the hazardous area in the plant. Many marginal cases can be found where hazardous gas conditions exist only occasionally through accidental leakage or breakage of containers. The Code outlines the conditions in general, but administrative authorities, insurance company inspectors, or state or municipal authorities must analyze the cycle of operations and determine the class of hazard involved and the extent of the area. Where the location is judged to be sufficiently hazardous to constitute a Class I or Class II condition, motor and control apparatus of designs approved for such locations is required.

In this connection the word approved means Class I or Class II designs meeting the definitions of "explosion-proof" or "dust-explosion-proof" machines. Motors and controls built and tested in accordance with

the requirements of the Standards issued by Underwriters' Laboratories usually are fully acceptable to authorities enforcing the Code.

The term explosion-proof is defined by the National Electrical Manufacturers Association and also in the National Electrical Code as:

"An explosion-proof machine is one in an enclosing case which is designed and constructed to withstand an explosion of a specified gas or vapor which may occur within it, and to prevent the ignition of the specified gas or vapor surrounding the motor by sparks, flashes, or explosions of the specified gas or vapor, which may occur within the machine casing."

A newly adopted NEMA Standard for machines for hazardous dust locations reads:

"A dust-explosion-proof machine is one in an enclosing case which is designed and constructed so as not to cause the ignition or explosion of an ambient atmosphere of the specific dust, and also not to cause the ignition of the dust on or around the machine.

"Note 1. Successful operation of this type of machine requires avoidance of overheating from such causes as excessive overloads, stalling, or accumulation of excessive quantities of dust on the machine."

These terms are not meant to apply to explosives—that is, oxygen-bearing compounds. The definitions do not cover "explosives-proof" equipment.

Away From Danger

One of the oldest methods of meeting hazardous conditions is to locate electrical equipment outside of a hazardous area. This solution cannot always be carried out readily, although it is sometimes necessary; for example, with gases having low ignition points.

Even when remote location is used, it is common practice to install a totally enclosed type of motor.

Closely related is the practice of locating motors and controls in a special room within the hazardous area, which is kept under positive ventilation. In this way hazardous gases or dusts may be kept away, thus allowing the use of more or less standard equipment.

The use of explosion-proof and dust-explosion-proof motors and controls is the most logical and most convenient method of meeting hazardous conditions, provided available motor and control designs are suitable.

In general, the development of these motors has centered around Class I, Group D, designs. Motors ranging in size from fractional-horsepower to 1000 horsepower, 3600 r.p.m., have been developed and thoroughly explosion-tested for Class I, Group D, gases and vapors. Included are squirrel-cage motors of all types, wound-rotor motors, gearmotors, brake motors, and motor-generator sets. Also controls of either the air-break or the oil-immersed types in popular sizes.

Development of motors for Class II conditions started with designs particularly suited for Class II, Group G, grain dust conditions as found in elevators, feed mills, and similar locations. Lately this development has been expanded greatly.

Designs of fully tested motors for use where metal dusts are present, also in coal and coke dust, have been made available up to very large sizes.

Inert-gas-filled motors are particularly useful in sizes above 400 or 500 horsepower where it becomes increasingly more difficult to design totally enclosed, fan-cooled, explosion-proof motors. This design is provided with an enclosure tight enough to confine inert gas under slight pressure, thus preventing entrance of hazardous air.

Minimum Design Requirements for Class I and Class II Motors and Controls (Air-Break)*

Major Features	Class I, Group D	Class II, Groups F and G
General	Must be "explosion-proof"	Must be "dust-explosion-proof"
Casing or enclosure	Strength giving calculated safety factor of 5 over maximum explosion pressure. Control must also stand hydrostatic test	Substantial. Dust-tight
Bolt strength, spacing, and location	6-in. maximum spacing best. Strength for safety factor of 5. Maximum hole clearance 0.031 in. with specific joint widths	Sufficient number of bolts to maintain dust-tightness
Joint widths and clearances	Threaded joint with five full threads, or rabbet joint not less than ½-in. width for fractional-horsepower motors and small controls: ¾-in. width for integral-hp. motors and larger controls. Maximum clearance of 0.002 in. Flat joint, 1-in. width, same clearance	Metal-to-metal joint ¼-in. minimum width. Gasket ⅜-in. minimum width, permanently attached, permissible for motor terminal boxes and control cases
Length of path and clearance at shaft openings	Minimum length 1½ in. with 0.025-in. maximum clearance. (Alternative constructions permitted for fractional-hp. motors). Controls, 1-in. minimum path with 0.0033 in. maximum clearance	Length of path not less than ½ in. with maximum diameter clearance 0.005 in. or equivalent
Sealing of leads	Leads tightly fitted in motor case, sealed by specified non-softening, non-cracking compound, ⅝ to 1¼-in. depth, according to motor size	Same as Class I except reduced depth of ⅛ to ⅝ in. permitted
Terminal box or method of connection	Independently explosion-proof terminal box or equivalent, for motors. Control requires threaded holes for rigid conduit connection, five full threads	Substantial terminal box required for motors. Control must be tapped to permit connection with rigid conduit, three full threads or ¼-in. minimum
External fans	Non-sparking metal, substantially guarded and mounted with ample clearance	Same as Class I
Plugs in enclosures	No removable plugs in ball-bearing motor enclosure. Control, minimum number of holes to permit usual connections. Unused holes closed with plugs engaging five full threads	No removable plugs advisable for motors. Control, minimum number of holes to permit usual connections. Unused holes closed by plugs, three threads, or ¼ in.

Note: Designs must always be proved by tests of representative samples. Constructions differing from details in table may be used if found by test to be equivalent.

*Oil-immersed Class I, Group D, control minimum requirements are: (1) a substantial casing; (2) mechanical and soldered electrical connections or joints and arcing parts immersed in oil to a minimum of 6 inches; (3) visible oil level indicator.

Pipe-ventilated motors are somewhat limited in their usefulness for hazardous locations. These motors are usually of a standard enclosed design, arranged for attaching pipes for incoming and outgoing air.

Successful use of such motors depends on maintaining in them a continuous, adequate supply of clean air. Tight piping is essential, and the accumulation of hazardous material on the motor frame and piping is to be avoided. Under some conditions it may be desirable to install automatic fire extinguishing equipment within the motors and air ducts.

Industry standards for Class I motors and control were promulgated a few years ago by the Underwriters' Laboratories in cooperation with electrical manufacturers. These standards are based on the assumption that it is impracticable to design motors and controls to be gas-tight, and that explosions will occur within the enclosures, through failure of a winding, or normal arcing of contacts. According to the definition of an explosion-proof machine, the construction must withstand an explosion of a specified gas and prevent sparks or flame passing out to the surrounding atmosphere.

Class II motors and controls are designed to meet the requirements of Underwriters' Laboratories standards for such equipment and are based on the fact that it is practicable and relatively easy to make motors and controls dust-tight. Hence, dust explosions will not occur within such apparatus. On this basis, enclosures or casings need not be designed to withstand an explosion but must be of substantial construction to maintain dust tightness permanently

The major requirements for Class I and Class II motors and controls are summarized in the table.

Figure 1 shows the external construction of Class I, Group D, motors and controls to meet the design requirements summarized in the table. Figure 2 shows a cut-away view of this design of motors. Cast iron is widely used for curved and irregular parts, with fabricated steel construction for parts having large flat areas. Compounds of litharge and glycerin are preferred for sealing leads in motors, since these materials are non-shrinking and resistant to most conditions.

Some designs of motors and controls are not only explosion-proof but are also designed for dust tightness, allowing them to qualify as Class II dust-explosion-proof equipment.

Class II motors and controls designed specifically for use in combustible dusts may completely meet all the requirements for dust-explosion-proof equipment without meeting the Class I design requirements for explosion-proof equipment. This is because dust tightness can be obtained with relatively thin enclosing parts that would not stand an internal explosion. Consequently, thinner cast-iron or sheet-steel enclosures are often employed for Class II motors and control (see Figure 3).

Compounds for sealing of leads are usually of the type used for Class I equipment.

Close clearances at the shaft openings prevent entrance of dust into bearing housings. Usually, labyrinth seals of the rotating type with non-sparking metal parts are employed.

After the hazardous location has been classified, install motors and controls designed specifically for that particular class and group of hazard, unless one of the alternative methods of meeting the condition is considered fully adequate. Do not assume that motors and controls designed for one classification are necessarily suited for use in a hazardous location of a different classification. For example, equipment designed for Class I, Group D, hazardous gas locations is not suitable for use in Class I, Groups A, B, and C, locations. It may or may not be suitable for Class II dust hazards, depending on whether the manufacturer has incorporated both Class I and Class II features in one design. Likewise, motors designed for Class II, Group G, locations are not necessarily suited for use in other hazardous dusts, or in Class I hazardous gas locations.

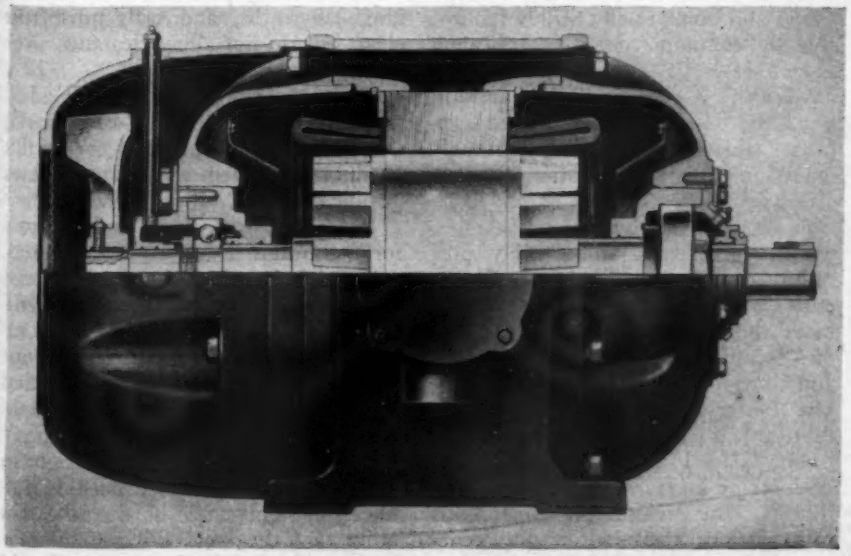


Figure 2. Cut-away view of a Class I, Group D, motor. Such motors are used where hazards approximate those of high-test gasoline

Return to Factory

After the motor or control device has left the factory, it is not possible for the manufacturer to state whether it is suited for a different class of hazard. To determine its suitability for another hazard, the equipment must be returned to the factory, or be given a field inspection.

When no available explosion-proof or dust-explosion-proof motors and controls are suitable for a certain hazard new apparatus must be developed, or one of the alternative methods employed. For example, no motors or controls are now available for atmospheres involving acetylene, hydrogen, and carbon disulphide, mainly because they involve high explosion pressures or very low ignition temperatures, and are not encountered frequently enough to warrant the very special designs needed.

The selection of air-break (NEMA Type 7) controls rather than oil-immersed (NEMA Type 8) controls for low-voltage applications involving hazardous atmospheres depends upon several factors. Much depends on whether corrosive gases also are present. The oil-immersed type of control affords better protection against corrosion than the air-break type. Also, it is not so limited in size, since it is not required to stand internal explosions.

Many relays and devices are not suitable, however, for operation in oil. Then the air-break type is indicated. It is always advisable to select the air-break type where frequent operation is encountered, unless conditions make oil-immersion necessary.

The manufacture of some high explosives involves hazardous areas, part of which may be within the scope of Class I, Group D, equipment. Other areas involve special hazards for which

no motors and controls have been specifically designed. This is true in manufacturing plants, as well as in some ordnance establishments.

Where Class I, Group D, or Class II, Groups E, F, or G, motors are selected as the best available, their successful use will depend not so much upon tightness against entrance of the dust involved as upon the selection and maintenance of proper overload relays, and preventing the accumulation of dust on the motors.

(Note—Where space limitations and motor rating permit, the use of non-ventilated enclosed rather than fan-cooled enclosed motors is preferable in high-explosive plants, because the former construction has no out-of-sight passages where dust can accumulate unnoticed.)

Distribution systems for hazardous areas must provide adequate voltage at all times at the motor terminals to prevent stalling and overheating. Protective devices of adequate interrupting capacity also must be employed.

Consideration may well be given to the possibility of isolating the controllers for groups of motors in separate, specially ventilated rooms, permitting the use of standard designs.

Pushbutton stations and similar devices, which often must be located near the motor, must, be of the type approved for use in the hazard.

Rigid conduit, with threaded explosion-proof joints (five full threads), and explosion-proof fittings are specified for Class I locations by the National Electrical Code. Flexible fittings of the explosion-proof type are permissible at motor terminals where movement of the motor is required.

Seal Conduit Runs

Conduit runs must be sealed off in an approved manner when the conduit terminates in enclosures where arcing or sparking is likely to occur, as at controller cases, and pushbutton enclosures. Seals are required also where conduit leaves a hazardous area. With terminal and junction boxes into which conduits of 4-in. diameter are run, seals of an approved type must be made within 2 feet of such boxes, in order to prevent excessive pressures in case of an explosion within the conduit or the box.

Seals must be made with approved sealing fittings and compound.

Rigid conduit with threaded joints is also required by the National Electrical Code for Class II installations. It is permissible to use flexible connections, such as flexible steel conduit, for short lengths where it is necessary to allow for movement. But sealing of the conduit system is not required.

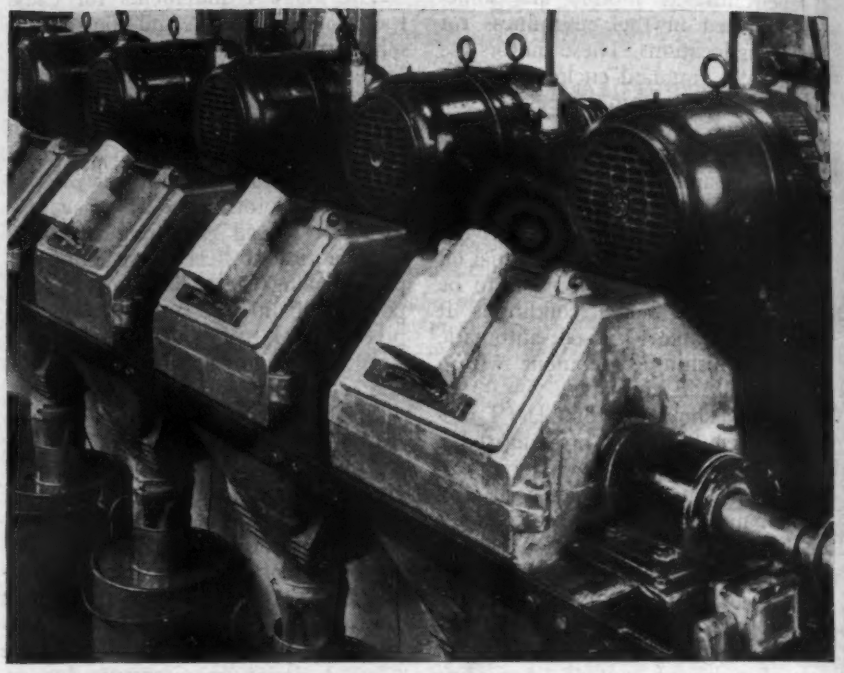


Figure 3. Here a bank of 7½-hp. single-speed and one 2-hp. multispeed Class II, Group E, motors drive machines for pulverizing magnesium

In Class I and Class II installations it is particularly important to make sure that branch circuit protective devices and running overload-protective devices are properly selected and maintained. If these devices are not large enough, trouble from excessive tripping will be encountered. If too large sizes are selected the motor may stall or run overloaded until excessive heating occurs.

The design of Class I and Class II motors and controls involves relatively simple structures and parts, fastened together by threaded joints or by capscrews and bolts usually readily removable by common tools. Complicated assemblies are avoided.

Cleanliness is especially important for Class II motors since dust can cause considerable heating through reduction of natural radiation of heat.

Never disassemble motors and controls designed for hazardous locations within such areas unless every precaution is taken to disconnect all circuits and avoid arcing. If possible move the equipment to a non-hazardous location. Clean Class. II motor and control enclosures before reassembly. Never expose ball bearings or lubricants to dusts or harmful gases.

For Class I motors operating out-of-doors or in excessive moisture conditions, the reassembly operations must include treatment of the joints to avoid corrosion and prevent water leakage. Proper sealing can be accomplished by applying to the joints, during assembly, a water-repelling, rust-preventive grease or compound, or ordinary petroleum jelly having a flash point above 165 degrees C. Remove excess grease from the assembled parts and apply a coating of a suitable sealing material, at least around the top half of the motor.

Carefully fit all parts together. Put bolts and capscrews in their correct places and tighten securely.

Avoid substituting bolts or other parts. Do not machine or make other changes in any parts, particularly those forming the enclosure.

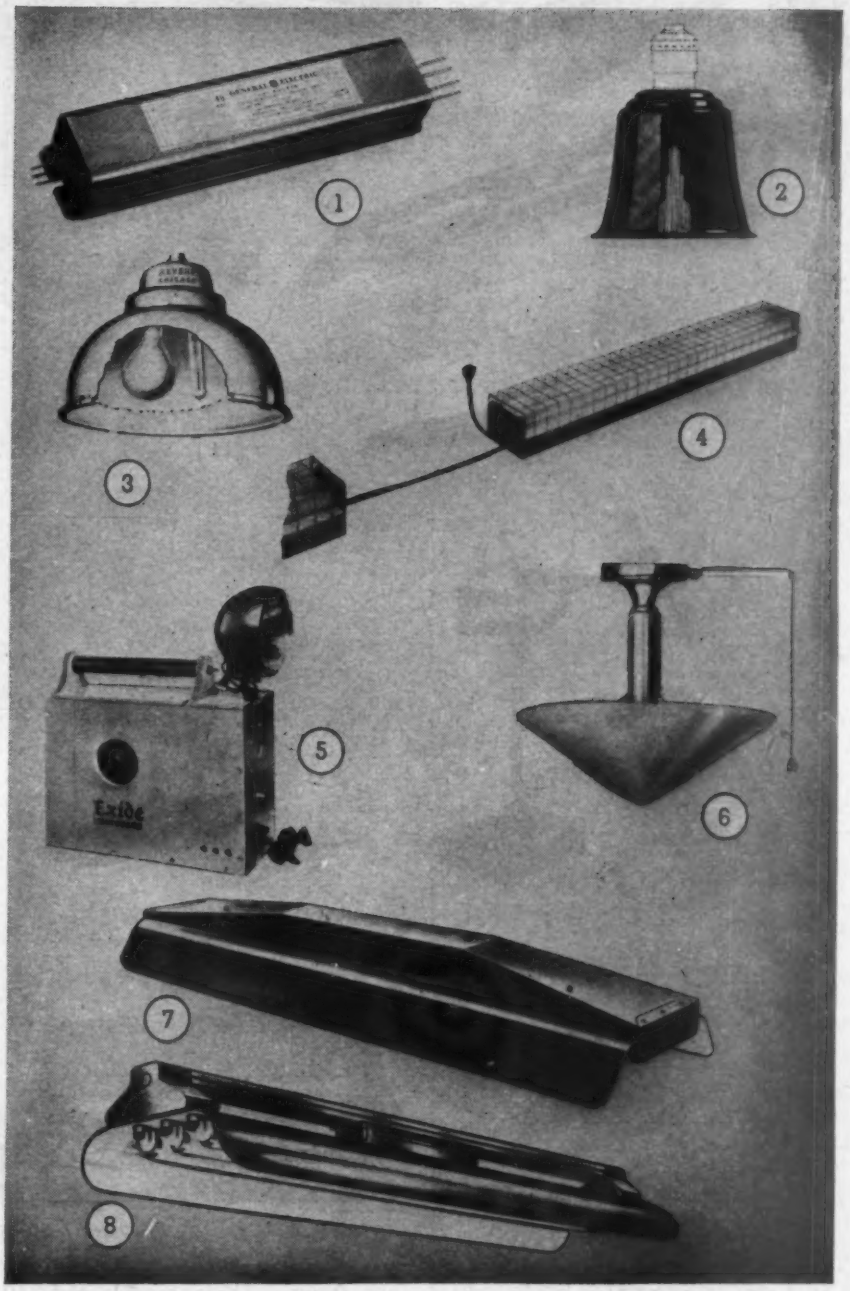
All rotating parts such as shafts, fans, labyrinths, and seals must run clear, but do not allow clearance over the original design.

Under no circumstances drill additional holes into the enclosing parts, even though it is intended eventually to fill or close them up with capscrews or pipe plugs.

If any parts of motors and controls for hazardous locations are altered, replaced, or omitted, or if clearances between parts are changed, the significance of the Underwriters' Laboratories label will be altered. Attachment of this label at the factory signified compliance with requirements established by test at Underwriters' Laboratories. Modification of the design in any way by unauthorized persons nullifies the significance of the label. In order that the label will not be misleading after such changes, it should be removed or a reinspection made by the Underwriters' Laboratories.

Lighting Equipment

Lighting equipment introduced to you by *Factory* during the past 12 months is reviewed here to give you a quick one-year summary



BALLAST—to simplify installation of 3-lamp, 40-watt fluorescent lighting fixtures and reduce amount of wiring required for connections. General Electric Company, Schenectady. (Figure 1)

DIMOUT SHADE—of plastic material, renders a permanently shielded 90-deg. cone of light, for use in industrial halls, corridors, and other darkened areas. Laduby Company, New Haven, Conn. (Figure 2)

DOME REFLECTOR—employs both a 300-watt incandescent lamp and a 25-watt mercury lamp to attain illumination approaching daylight, and is designed to give wide, even distribution of light with a minimum of direct glare. Revere Electric Manufacturing Company, Chicago. (Figure 3)

DOUBLE-CIRCUIT LIGHT—portable fluorescent type, has receptacles for plugging in small power tools and additional light fixtures, and comes with brackets for hanging, also hinged wire lamp guard. Lumidor Manufacturing Company, Los Angeles. (Figure 4)

EMERGENCY LIGHTING—unit that is self-contained, portable, and requires only plug-in connections to a.c. supply, operates instantly and automatically when other lights go out. Throws a 200-ft. beam of light 50 feet wide, covering an area of 7400 square feet. The Electric Storage Battery Company, Philadelphia. (Figure 5)

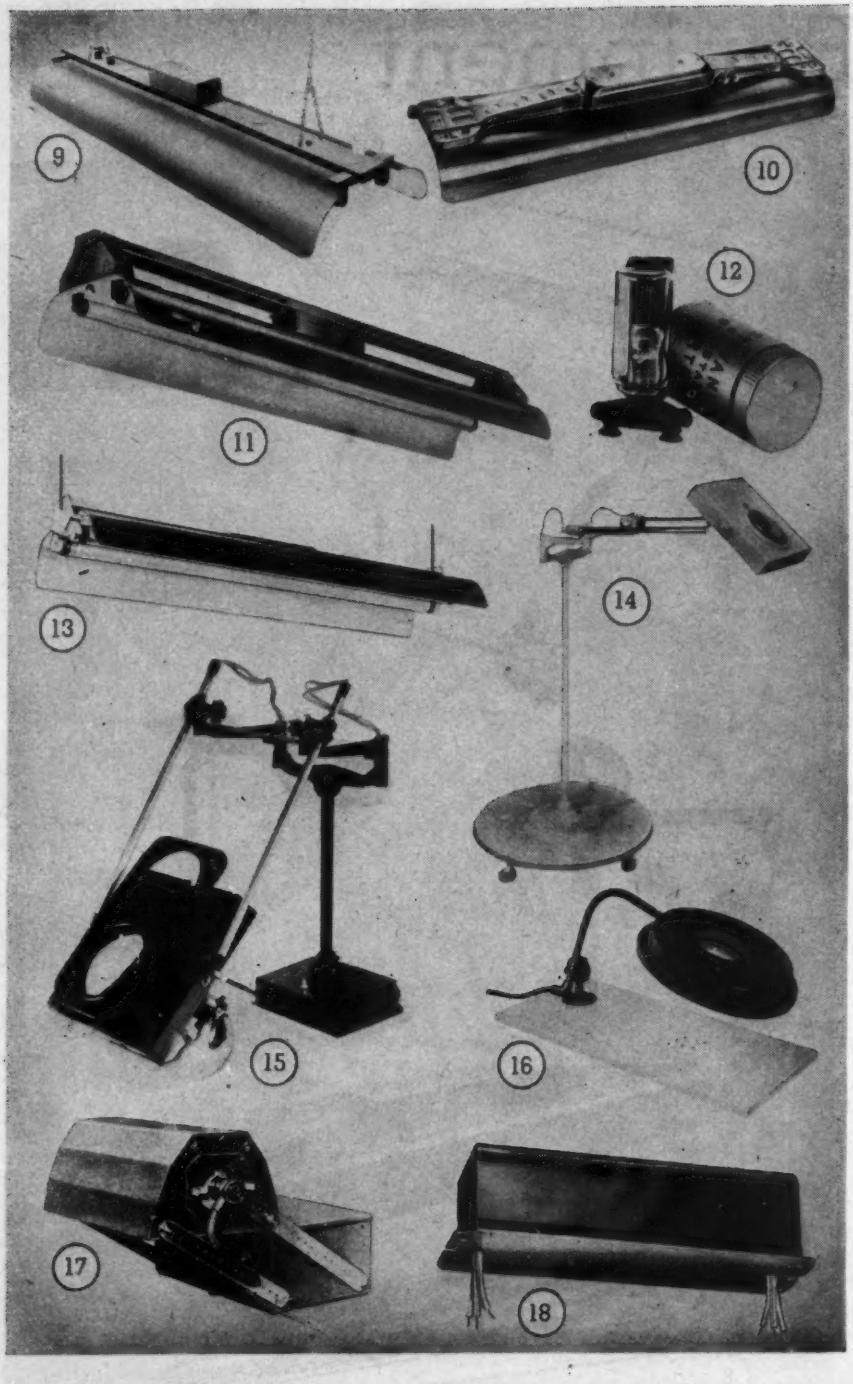
EXPLOSION-PROOF LIGHT—fluorescent unit, complies with requirements for Class I, Group D, and Class II, Group G, hazardous locations. Appleton Electric Company, Chicago.

EXTENSION ARM—is designed to fit over levolier switch lever for elimination of rubbing of lamp pull-cord against reflector, shade, or bowl. McGill Manufacturing Company, Inc., Valparaiso, Ind. (Figure 6)

FLOODLIGHTING PROJECTOR—made of steel or cast iron treated by porcelain enameling that is said to give weather-resistant and rustproof properties, RDS models are available in lamp ratings of 300, 500, 750, and 1000 watts. Benjamin Electric Manufacturing Company, Des Plaines, Ill.

FLUORESCENT FIXTURE—called Quick-Liter, is designed to reduce maintenance requirements by elimination of starter switch and use of a super-ballast and patented wiring circuit that permits operation on wider varying voltages and temperatures. Available for two 40- or 100-watt lamps, 110-120 or 220-240 volts. The Edwin F. Guth Co., St. Louis. (Fig. 7)

FLUORESCENT FIXTURE—designed in compliance with war limitations, Day-Line has non-metallic reflectors and channel covers finished in baked enamel, with steel wiring channel and end boxes welded together for



sturdiness. DayBrite Lighting, Inc., St. Louis. (Figure 8)

FLUORESCENT FIXTURE — features the Flexi-Coupler, a device that permits spacing of fixture units in continuous rows as much as 6 inches apart, reducing number of 100-watt units by one in every 50-ft. run. Martin-Gibson Company, Detroit. (Figure 9)

FLUORESCENT FIXTURES—have completely enclosed non-metallic reflectors that are anchored to top housings with captive latches that release with a quarter turn; units can be joined into a continuous row by simple joining straps. Three models—two 40-watt lamps, 100 wattage; three 40-watt lamps, 150 wattage; two 100-watt lamps, 235 wattage. Sylvania Electric Products, Flourescent Fixture Division, Ipswich, Mass. (Figure 10)

FLUORESCENT FIXTURE—Model MF-240-N claims instantaneous starting, also reduced maintenance cost because of elimination of starting switch. Will operate during momentary voltage drops below 50 volts. The Fostoria Pressed Steel Corporation, Fostoria, Ohio.

FLUORESCENT FIXTURE—named Mitchelite, is made with minimum amount of steel to meet wartime requirements, and features Lumenite reflector and "easy-fit" wireway channel for mounting in continuous row. Mitchell Manufacturing Company, Chicago. (Figure 11)

FLUORESCENT FIXTURE—that is claimed to accomplish metal saving without sacrifice of efficiency, ease of installation, or maintenance economy, has non-metallic reflector with baked-on glaze enamel reflecting surface and a grey enamel exterior. Commercial Metal Products Company, Chicago.

FLUORESCENT STARTER—glow-type, named Glostat, is stated to be capable of taking severe punishment from a failed lamp and to give long service, available in ratings of 15-20 and 30-40 watts. Sylvania Electric Products, Inc., Lighting Division, Salem, Mass. (Figure 12)

FLUORESCENT UNIT—features a non-metal reflector known as Lumenite that is claimed to be tough and strong, moisture- and high-heat resistant, non-corrosive, and non-scaling. Mitchell Manufacturing Company, Chicago. (Figure 13)

HOT CATHODE FLUORESCENT—lighting unit, known as Artkraft, is claimed to light at 40 degrees below zero, and to give more light for same current, with lamp guarantee of at least 3000 hours. Artkraft Sign Company, Lima, Ohio.

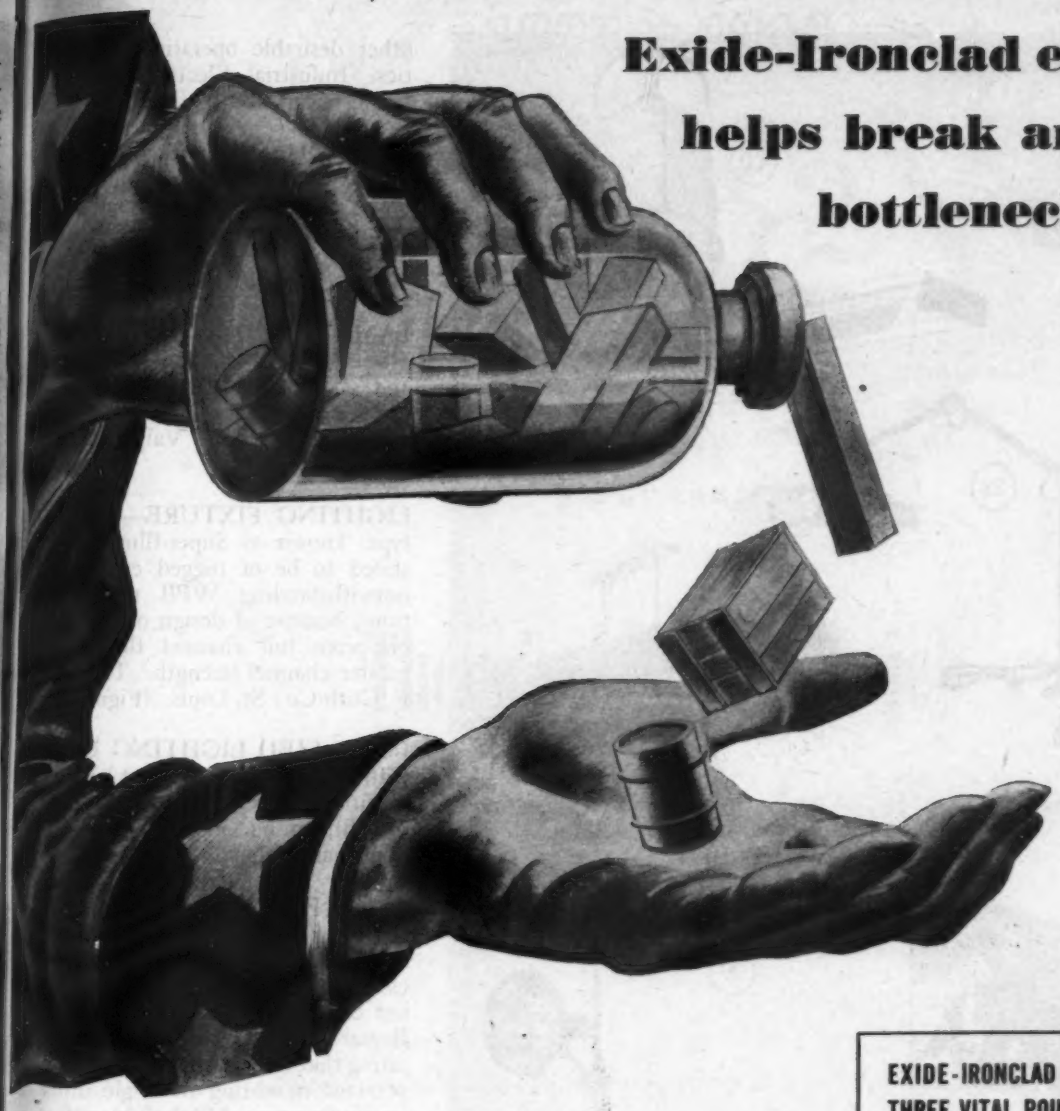
INSPECTION INSTRUMENT—built as a portable floor model on wood-wheel casters, carries a two-tube fluorescent-lighted adjustable mounting holding 5-in. single or double magnifying lens. Larrimore Sales Company, St. Louis. (Figure 14)

INSPECTION INSTRUMENT—provided with fully adjustable bracket, and employing fluorescent lighting combined with single or double 5-in. magnifying lens, the "Inspector" is intended for close examination in production or inspection work. Larrimore Sales Company, St. Louis. (Figure 15)

INSPECTION LIGHT—of dust-tight construction, is essentially a magnifying lens with auxiliary lighting for use in ordnance plants where open units are not acceptable. Curtis Lighting, Inc., Chicago. (Figure 16)

INSPECTION LIGHT—portable fluorescent type, equipped with 20-ft. extension cord and ballast box, is made

Exide-Ironclad efficiency helps break another bottleneck



Materials-handling could have been our biggest bottleneck . . . if it hadn't been for the efficient way in which Industry tackled the problem of labor shortages and increased shipping demands.

Right in the forefront is the job being done by Exide Batteries in helping speed materials along the production line. Efficient electric industrial trucks are powered with Exide-Ironclad Batteries for complete dependability. These sturdy workers help shift vital materials right through to every fighting front. Another potential bottleneck has been broken by American *know-how.*

THE ELECTRIC STORAGE BATTERY COMPANY, Philadelphia 32

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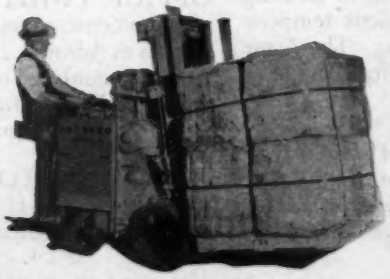
EXIDE-IRONCLAD BATTERIES OFFER THREE VITAL POINTS OF SUPERIORITY

- MORE POWER, MORE PRODUCTION: An Exide-Ironclad delivers its power at uniform voltage to assure constant hauling speeds. There is always a giant surge in reserve when an Exide powers your battery propelled vehicles.
- LONG LIFE SAVES MATERIALS: Every Exide is built to last, and saves vital materials by squeezing the last ounce of use out of the materials in it. When you buy an Exide, you definitely . . . Buy to Last and Save to Win.
- EASY MAINTENANCE, SAVES LABOR: Exides are kept charged by the simplest method ever devised. With the Exide Charge Control Unit all you do is connect battery to the charging source and turn a knob.



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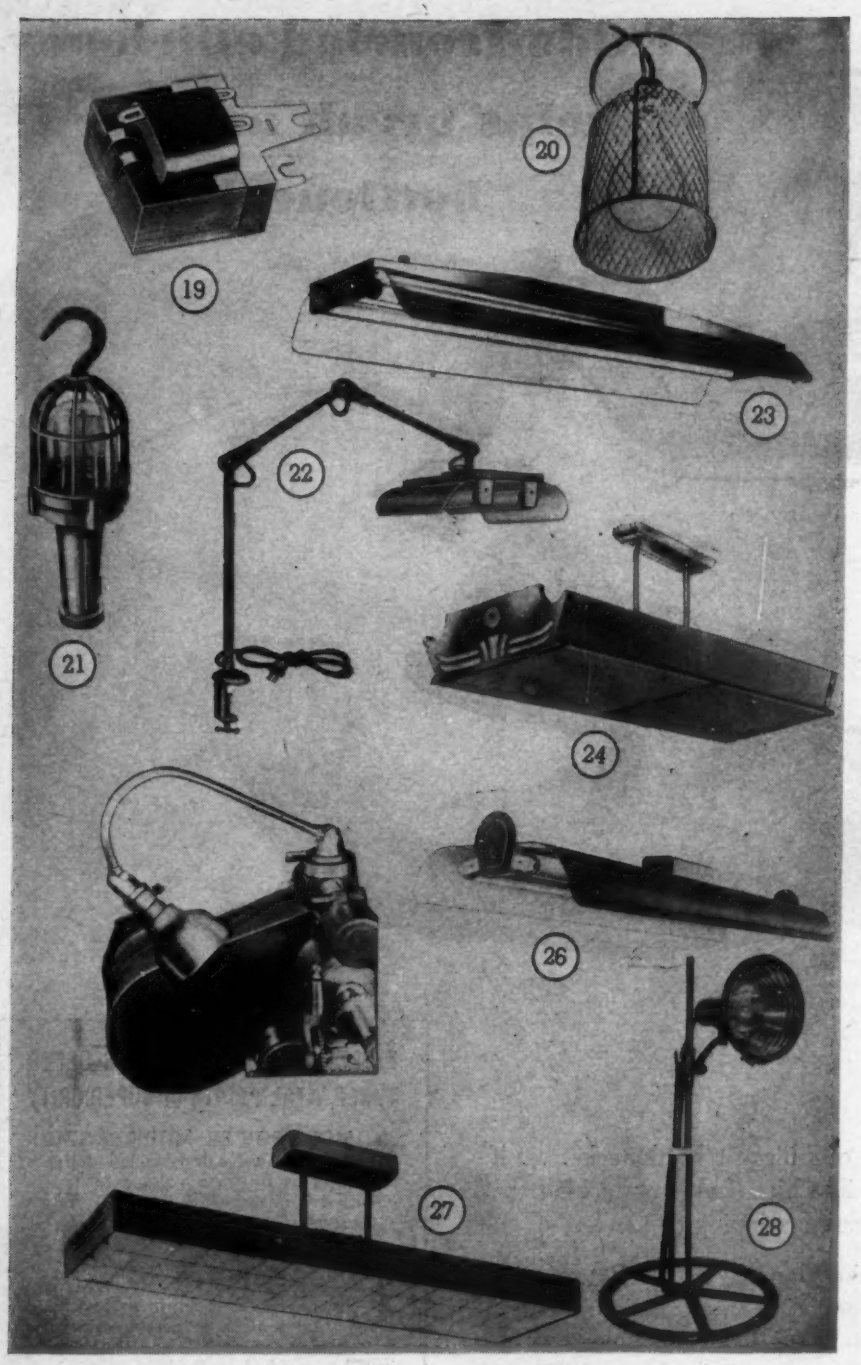
BATTERIES



of plastic with combination metal light baffle and support that shields inspector's eyes from light. Commercial Reflector & Manufacturing Company, Los Angeles.

INSPECTION LIGHT—using monochromatic sodium vapor arc as a light source, is made in several types to suit specific applications. George W. Gates & Company, Franklin Square, L. I., N. Y. (Figure 17)

LAMP BALLAST—called 240 B Streamliner, is claimed to balance the light output and power consumption of two fluorescent lamps, 90 degrees out of phase. Superior Electrical Industries, Chicago.

LAMP BALLAST—is designed for exposed mounting on fluorescent fixtures, claiming thereby a saving in housing metal and a lower ambient temperature because of air-cooling. The Acme Electric & Manufacturing Company, Cuba, N. Y. (Figure 18)

LAMP BALLAST—is of plug-in type, called Magno-Tronic, featuring a non-magnetic alloy airgap that is claimed to offer long fluorescent lamp life and other desirable operating characteristics. Industrial Electronics Corporation, Newark, N. J. (Figure 19)

LAMP GUARD—built on cantilever principle to withstand rough, hard usage, the portable Hoffcrafter cage guard is said to be capable of bearing 500 pounds in larger sizes. Hoffman Company, York, Pa. (Figure 20)

LAMP GUARD—is said to be shock-proof, vapor-proof, and non-sparking, and safe for use even in wet places. McGill Manufacturing Company, Inc., Electrical Division, Valparaiso, Ind. (Figure 21)

LIGHTING FIXTURE—fluorescent type, known as Super-Illuminator, is stated to be of rugged construction, notwithstanding WPB steel limitations, because of design of die-formed one-piece full channel that imparts greater channel strength. The Edwin F. Guth Co., St. Louis. (Figure 22)

LOCALIZED LIGHTING UNIT—with two 14-watt fluorescent lamps said to furnish in excess of 100 foot-candles of light, can be variously positioned by double-arm adjustment. The Fostoria Pressed Steel Corporation, Fostoria, Ohio. (Figure 23)

LUMINAIRE—fluorescent fixture claiming high lighting efficiency without excessive glare, known as U.R.C. Research, is 4-lamp unit of 200-watt rating that can be adapted to surface or pendant mounting in single units or continuous row. Mitchell Manufacturing Company, Chicago. (Figure 24)

MACHINE-LIGHTING UNIT—for directive lighting, is said to stay put at any angle and not to be affected by vibration, and can be adjusted both at socket and base. Reliance Devices Company, Inc., New York. (Figure 25)

NON-METALLIC REFLECTOR—is featured in Generalite fluorescent lighting units, which can be removed from the top of wiring channel without turning off current, simply by loosening two wingnuts and lifting off. The Fostoria Pressed Steel Corporation, Fostoria, Ohio. (Figure 26)

OFFICE LIGHTING UNIT—of wooden construction, fluorescent type, known as Admiral, can be obtained for single mounting or for continuous runs. Wakefield Brass Company, Vermilion, Ohio. (Figure 27)

PORTABLE FLOODLIGHT—consists of vertical 6-ft. pipe stanchion on heavy cast-iron circular base, on which

There's still a big job for all of us to do

NOTHING MATTERS NOW except the swift and certain winning of the war.

Through the prodigious production accomplishments of American industry, our men and our Allies have been able to swing the initiative in fighting to our side.

To keep it...to continue a steady march on the bloody road to victory... we've got to give our men in the thick of the fight everything they'll need. And give it to them faster and faster!

For you and for us there's *still* a big job to be done. The history of the amazing production performance of American industry is *still* to be written.

Every single man-hour, every bit of brain power, every ounce of industrial energy expended for any purpose other than victory will damage the war effort.

The entire production of Hyatt Roller Bearings now goes into planes our men fly... into tanks they drive... into ships they sail... into guns they man... into equipment they need to win.

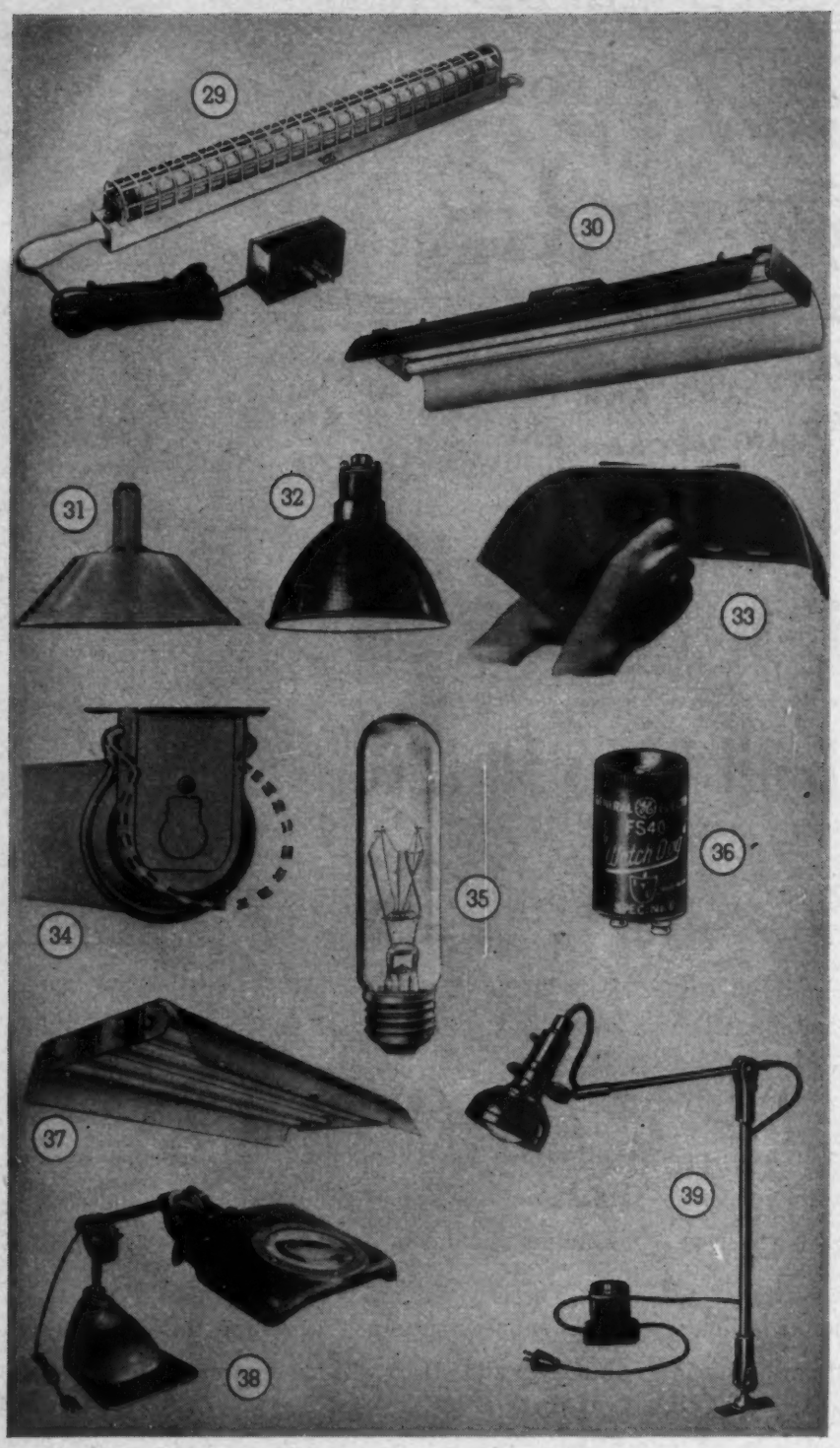
In the midst of pouring out a tremendous stream of bearings for this vital war use, we pause to again thank industry for its grand cooperation and understanding, and for helping us meet war's demands for super-precision production on a mass scale.

As soon as the war's won, and this job is done, Industry and Hyatt will have another big job to do together... when we can work in Peace.

Hyatt Bearings Division, General Motors Corporation, Harrison, N. J.

DIVISION OF

HYATT BEARINGS **GENERAL MOTORS**



is mounted floodlight unit for 300 or 500 watts that can be adjusted to any height or direction. Steber Manufacturing Company, Chicago. (Figure 28)

PORTABLE FLUORESCENT—lamp available in 6- and 15-watt ratings, is designed to provide diffused lighting with low surface brightness, and to insure better visibility on shiny metal surfaces. The Edwin F. Guth Company, St. Louis. (Figure 29)

REFLECTORS—for fluorescent lighting in chain or rigid suspension types, are made of Silv-A-Tex, a lightweight, sturdy, non-metallic composition that is claimed to be resistant to heat, moisture, and corrosion. Bright Light Reflector Company, Inc., Brooklyn, N. Y. (Figure 30)

REFLECTORS—made of translucent Plaskon and trademarked Commodore, are made in 15- and 19-in. sizes for lamps from 200 to 500 watts. F. W. Wakefield Brass Company, Vermilion, Ohio. (Figure 31)

REFLECTORS—of deep bowl design to confine light rays and throw them directly on work, are made in several diameters and sizes in shadeholder and detachable socket types, with standard finishes of green on the outside and white on the inside. Steber Manufacturing Company, Chicago. (Figure 32)

REFLECTOR LATCH—called Captive Latch, is a spring-type fastening for holding composition reflector securely to top housing, and requires only quarter turn by hand for reflector removal. Sylvania Electric Products, Inc., Lighting Division, Salem, Mass. (Figure 33)

SAFETY LAMP LOCK—is an integral part of each socket of Aero-Designed fluorescent fixtures, to minimize risk of lamps falling from sockets, yet it does not interfere with relamping or cleaning. The Miller Company, Meriden, Conn. (Figure 34)

SPATTERPROOF LAMP—trademarked Radiant, is made of special glass that resists penetration of hot metal particles, for welding and rough industrial service. Available in 50-, 75-, 100-, and 150-watt sizes. Radiant Lamp Corporation, Newark, N. J. (Figure 35)

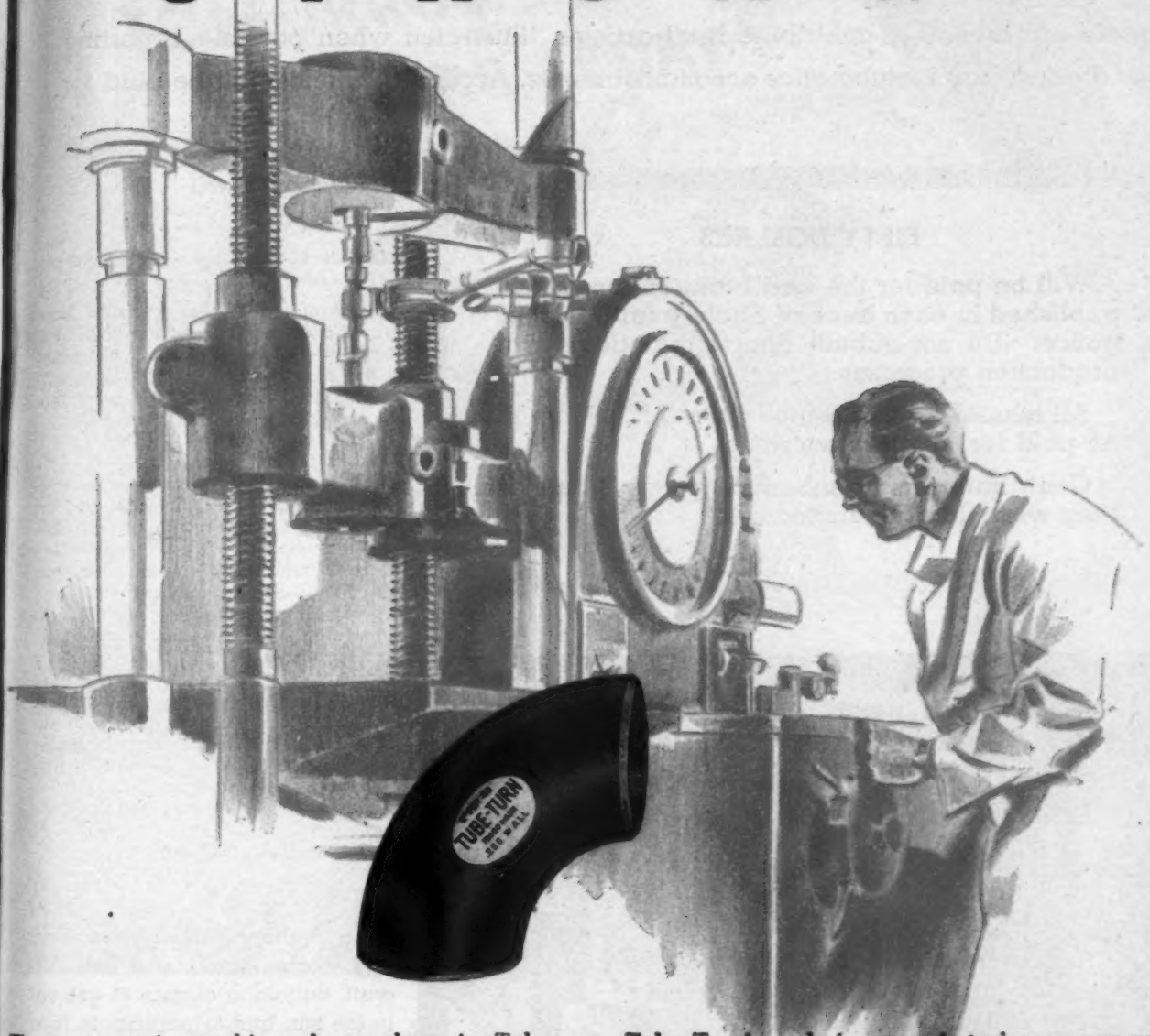
STARTER—for fluorescent lamps, called Watch Dog, is a manual-reset type for 40-watt lamps. It gives quick and positive performance in the lockout of dead lamps, eliminating blinking and flickering when a lamp burns out. General Electric Company, Bridgeport, Conn. (Figure 36)

WOOD-REFLECTOR FIXTURE—called Super-Maze-Lite, is designed to furnish high-intensity fluorescent lighting for industrial inspection areas, and has bump-proof ends to protect lampholders. The Edwin F. Guth Company, St. Louis. (Figure 37)

WORK ILLUMINATOR—for permanent or portable application, is provided with magnifier, and furnished with different types of specialized electric lamps to suit the job. Arco Tool & Die Works, Chicago. (Figure 38)

WORK LIGHT—called Diehl-Lite, is intended for intense illumination on precision jobs, and uses 6-8 volt long-life lamp in conjunction with 110- or 220-volt transformer. Diehl Manufacturing Company, Finderne Plant, Somerville, N. J. (Figure 39)

STRONG

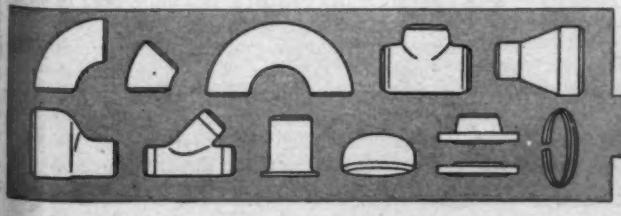


The stress-strain machine, shown above in Tube Turns' laboratories, scientifically records tensile strength.

Welding fittings *must* be strong. Stronger than pipe. For the greatest strain and vibration occur *at the fittings.* Strength is imperative against the high pressures, extreme velocities and corrosive wear to which fittings are subjected in many piping systems. Strong welding fittings help to hold leakage, breakdowns and consequent repairs to a minimum.

Tube Turn's exclusive manufacturing process produces *extra* strong fittings. Tensile tests on the stress-strain recording machine methodically *insure* the superior strength standards found in all Tube-Turn seamless welding fittings.

TUBE TURNS (Inc.) Louisville, Kentucky. *Branch Offices:* New York, Chicago, Philadelphia, Pittsburgh, Cleveland, Dayton, Washington, D. C., Houston, San Francisco, Seattle . . . Distributors located in principal cities.



TUBE-TURN

TRADE MARK

Welding Fittings and Flanges

MAINTENANCE SHORTS

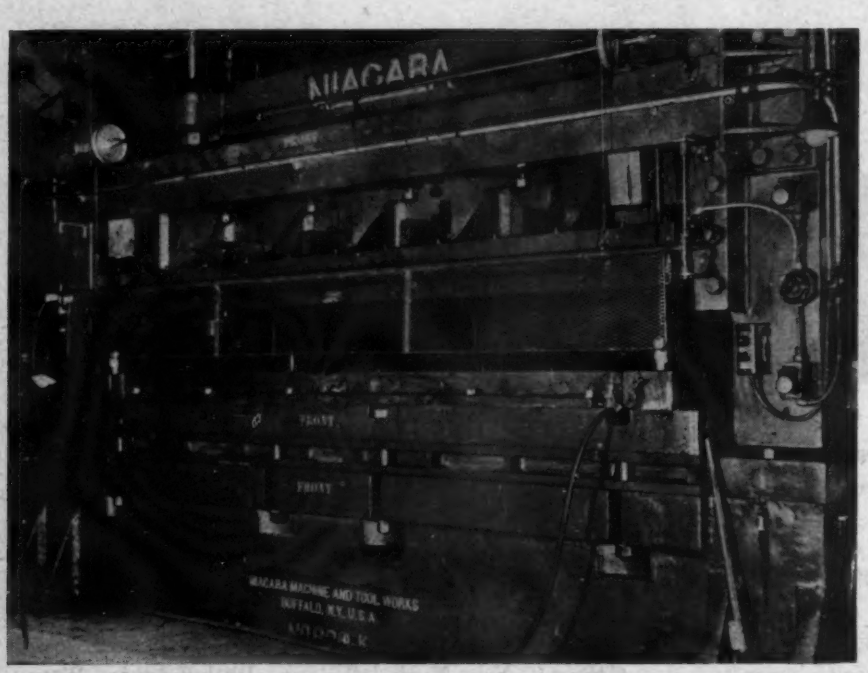
Readers are invited to contribute brief articles, illustrated when possible, reporting out-of-the-ordinary maintenance accomplishments. Accepted articles will be paid for

FIFTY DOLLARS

Will be paid for the best Maintenance Short published in each issue of *Factory* until further notice. (Do not submit Shorts that deal with production processes.)

All other Shorts accepted for publication will be paid for at attractive rates.

Contributors may submit as many items as they wish. Mail yours today!



Guard not only protects operator, but also acts as press control

Crank Press Guard Protects Operator

This suggestion won an award from the War Production Board.

Guard to protect operator from a large crank press consists of a trigger-operated gate which, pulled down into a cocked position, operates a limit switch that permits operation of the press. When the press has returned to its uppermost position, the trigger is released, and the gate is raised by counterweights.

The design of the gate and its operating mechanism is such that the normal operating switches could be dispensed with, thus utilizing the gate as the press control.

Suggested by James Whiteley, Bell Aircraft Corporation, Buffalo.

Glass Drilled With Pipe

LEON N. LOEB, S. S. Loeb, East McKeesport, Pa.

In view of the shortage of cutting tools, we have developed a method for drilling holes into single, double, or plate glass with a piece of pipe, preferably brass, with an outside diameter slightly smaller than the diameter of the hole to be drilled. A saw cut to a depth of about ¼ inch is made in the end used for the drill. After filling it with emery or carborundum powder to a depth of about 2 inches, the pipe is mounted in the drill press. The glass is placed on the bed of the press with a sheet of rubber under it whenever possible, to take care of any unevenness.

When the pipe is lowered to the glass, a few drops of a light machine oil or kerosene are placed around it. Lubrication is necessary at all times, but only just enough to keep the emery powder moist.

Very light pressure is used until the drilling is well started, to insure a straight hole, after which the pressure can be increased. The resulting hole has no rough edges, and we have found the breakage is less than with any other method of drilling we have tried.

•

An archery range gives men and women workers at Bell Aircraft, Buffalo, a chance to get out in the sun and to participate in a not-too-strenuous exercise. It develops the eyesight of the average worker the company finds.

•

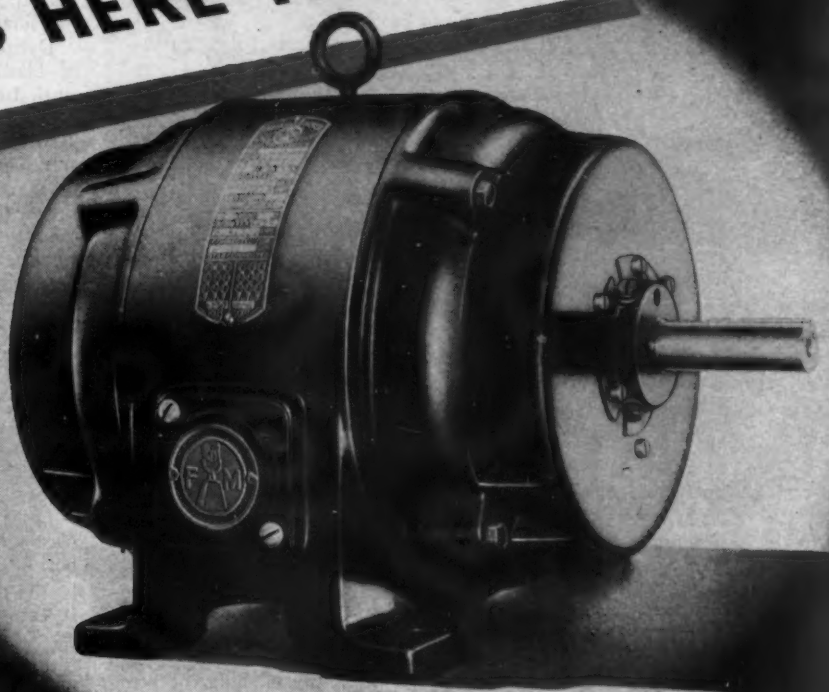
Load Check Alone May Be Misleading

D. KRAKAUER, Plant Manager, Kay Manufacturing Corporation, Brooklyn, N. Y.

In checking loads on a.c. motors, with hook-on or standard ammeter, particular care must be taken with well-loaded equipment. If the current is not more than, say, 10 percent over the full-load rating of the motor, it is often assumed that the motor can remain in service. This assumption may be dangerous, however, because:

Basically, the temperature in the motor windings is being checked because that determines how long the insulation will last. The motor has been designed so that at a

TOMORROW'S MOTOR IS HERE TODAY!



WITH *Copperspun* ROTOR

YOU can buy this new postwar designed Fairbanks-Morse motor now—*knowing* that it will be just as modern—just as efficient—just as up to the minute in years to come as it is today.

It is indeed a challenge to the future—in efficient motor design.

- It is a 40°C. motor.
- It is a protected motor!
- It has the most adaptable, convenient, and handiest conduit box you ever laid your eyes on!
- It has the famous Fairbanks-Morse COPPER-SPUN Rotor!

Important!

Never before has there been more stamina—more protection—more versatility built into a motor housing. A demonstration is necessary to fully appreciate how much this motor can really offer you. See it and judge for yourself.

Write Fairbanks, Morse & Co., 210 Fairbanks-Morse Bldg., Chicago 5, Ill.

FAIRBANKS-MORSE

DIESEL ENGINES
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MOTORS
GENERATORS
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STOKERS
FARM EQUIPMENT
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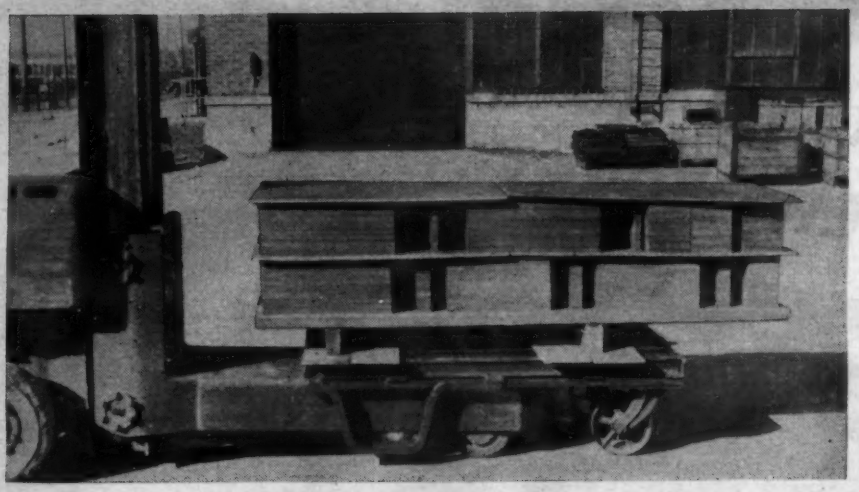
Motors



By replacing two legs of a steel skid platform with a pair of casters, at the Pittsfield Works of General Electric Company, loads of as much as 10 tons can be handled with a 3-ton lift truck. Because the weight of more than half the load is supported on the casters, there is no overload on the truck. The casters were welded to the skid at the Pittsfield Works of General Electric

little over full-load current it will still give off enough of the heat generated by its current to keep the temperature in the insulation within safe limits. In checking the current passing through the motor, we are assuming that the temperature resulting from the full-load current corresponds with what the designer planned for. But, if there is any condition preventing the motor from losing its excess heat, this may not be the case at all. The temperature may be much higher than it should, and the reading of the ammeter dangerously misleading.

Therefore it must be borne in mind that well-loaded motors are not safe unless they are reasonably clean, not blanketed with chips, dust or dust shields, and not inadequately ventilated because of clogged air passages or fouled fan blades.

Dynamite—for Clearing Crankshafts

SOURCE: The Ohio Crankshaft Company, Cleveland

A salvage procedure for removing broken drills quickly from the oil holes of precision-made crankshafts is used by The Ohio Crankshaft Company, Cleveland. In these plants, the use of dynamite eliminates scrapping a shaft because of a broken drill. No costly equipment is necessary to accomplish the dynamiting, and the blowing is clean-cut. A clearing in which the salvage work can be carried out, common dynamite, fuse, caps, wire, probe, putty, and a brace and bit are the only things needed. The procedure can be applied to any fixture, die, or part wherein drills, plug gages, or reamers may break.

The dynamiting technique is simple. The shaft is removed to a clearing outside the plant and placed on a platform, steel skid, or the ground. With a wire rod the hole is probed to determine the exact position of the drill below the bearing surface.

Dynamite is taken from a standard stick of blasting powder and pushed from a small trough into the hole with a round stick. No more than a thimbleful is ever used; generally, the amount is considerably less, depending upon the size of the hole and the set of the drill. Practice shows the proper quantity of powder to use for certain conditions but, in general, it is far better to use too little than too much.

A 6-in. fuse is next inserted into a small diameter, shoulder-free cap and dropped into the oil hole on top of the charge.

When ignited, a heavy plank or metal shield is placed over the bearing surface to check the flight of the drill member as it is blown free. Frequently, timbers are split or the drill penetrates metal guard sheets. It is wise to keep at a safe distance during the dynamiting.

Drills are freed by the pressure of the blast which follows the drill flutes to the bottom of the hole and there reverses itself to drive the piece out. As it leaves the shaft, the drill makes a ringing noise of metal striking metal.

There is no evidence of harm to the metal in this procedure. Thousands of crankshafts that have been subjected to this operation have turned in long service records.

To test results of dynamiting, the "blower" uses a common brace and bit. When the bit is inserted in the hole it reveals by difficulty in turning or by a clicking noise that the drill is still within. If it turns easily and backs out chips, the drill has been blown free.

A dynamiter loads the oil hole in a diesel shaft preparatory to blowing out drill that has broken off inside

As the fuse is lit, a 4x4 in. timber is placed across the bearing to check the drill when it is blown free

A putty dam is built up around an oil hole in which the drill has broken off flush with the bearing surface

Trade Marks "ScotTissue," "Soft-Tuff," "Washroom Advisory Service" Reg. U. S. Pat. Off.

THE MISSING MAN

is today often the MISSING WOMAN

NOW that there are 15,000,000 women in industry, with many more to be added in 1944, absences from work, caused by illness, become more serious than ever before . . . Because such absences are more frequent and longer among women than among men workers.

Even before "womanpower" became so important a production factor, illness kept a million workers off the job every day. But contagions such as the common cold and its complications cause half the absences—and contagions can be checked.

Why not provide sanitary washrooms equipped with soap, hot water and individual tissue towels —if you have not already done so? Such washrooms are "Health Zones." They encourage the thorough washing which cleans away germs of contagion. Your employees, especially the women, will appreciate your interest in their health and comfort.

The Scott Washroom Advisory Service shows how to make ScotTissue Towels go farther

For a complete check-up on your washroom facilities, call on the Scott Washroom Advisory Service. It may be able to suggest many improvements and economies.

If you use ScotTissue Towels, it will help you make your supply go farther. That's now of utmost importance. War brings tremendous new demands for Scott products . . . demands that production facilities cannot meet.

The only solution is careful use of the available supplies. For instance, our educational material reminds workers that *one* "Soft-Tuff" ScotTissue Towel dries completely . . . will, in fact, absorb twice the water left on hands. And it has ten times the rub strength of previous ScotTissue Towels, though soft as ever.

Scott Paper Co., Chester, Pa.

SCOTTISSUE TOWELS

STAY TOUGH WHEN WET

Handy Formulas for Electrical Work

1. Synchronous speed, frequency, and number of poles of a.c. motors and generators:

$$R.p.m. = \frac{120 \times F}{P}$$

$$F = \frac{P \times R.p.m.}{120}$$

$$P = \frac{120 \times F}{R.p.m.} \text{ where}$$

$R.p.m.$ = Revolutions per minute
F = Frequency, cycles per second
P = Number of poles

Example: An eight-pole induction motor is supplied from a 60-cycle circuit. What is its speed?

$$R.p.m. = \frac{120 \times F}{P} = \frac{120 \times 60}{8} = \frac{7200}{8} = 900$$

Example: A six-pole induction motor has a speed of 1000 r.p.m. What is the frequency?

$$F = \frac{P \times R.p.m.}{120} = \frac{6 \times 1000}{120} = 50$$

Example: An induction motor supplied from a 60-cycle circuit turns at 600 r.p.m. How many poles has it?

$$P = \frac{120 \times F}{R.p.m.} = \frac{120 \times 60}{600} = 12 \text{ poles}$$

2. Ohm's law:

$$I = \frac{E}{R};$$

$$R = \frac{E}{I};$$

$E = I \times R$, where
I = Current, in amperes
E = Electromotive force, in volts
R = Resistance, in ohms

Example: A filament lamp has a resistance of 250 ohms. When the lamp is connected to a 120-volt circuit, how much current flows through it?

$$I = \frac{120}{250} = 0.48 \text{ amperes}$$

Example: When a resistor is connected to a 220-volt circuit, the current flow is 3 amperes. What is the resistance?

$$R = \frac{E}{I} = \frac{220}{3} = 73.3 \text{ ohms}$$

Example: What voltage will be required to produce a current flow of 5 amperes through a resistance of 30 ohms?

$$E = I \times R = 5 \times 30 = 150 \text{ volts}$$

Since watts (W) or power (P) is the product of volts times amperes:

$$W = E \times I; \text{ or } W = I^2 \times R; \text{ or } W = \frac{E^2}{R}$$

$$E = \sqrt{W \times R}; \text{ or } E = \frac{W}{I}$$

$$I = \sqrt{\frac{W}{R}}; \text{ or } I = \frac{W}{E}$$

$$R = \frac{E^2}{W}; \text{ or } R = \frac{W}{I^2}$$

Example: How many watts are consumed by an electric heater that draws 5.3 amperes on a 115-volt circuit?

$$W = E \times I = 115 \times 5.3 = 609.5 \text{ watts}$$

Since the resistance of the heater is $115 \div 5.3 = 21.7$ ohms,

$$W = I^2 \times R = 5.2^2 \times 21.7 = 28.09 \times 21.7 = 609.5 \text{ watts, or}$$

$$W = \frac{E^2}{R} = \frac{115^2}{21.7} = \frac{13,225}{21.7} = 609.5 \text{ watts}$$

Example: An electric heater rated 500 watts has a resistance of 28.84 ohms and draws 4.16 amperes. What voltage will be required to operate it?

$$E = \sqrt{W \times R} = \sqrt{500 \times 28.84} = \sqrt{14,420} = 120 \text{ volts, or}$$

$$E = \frac{W}{I} = \frac{500}{4.16} = 120 \text{ volts}$$

Example: An electric heater rated 300 watts, 120 volts, has a resistance of 48 ohms. How many amperes will it draw?

$$I = \sqrt{\frac{W}{R}} = \sqrt{\frac{300}{48}} = \sqrt{6.25} = 2.5 \text{ amperes, or}$$

$$I = \frac{W}{E} = \frac{300}{120} = 2.5 \text{ amperes}$$

Example: A 1000-watt heater draws 4.54 amperes on a 220-volt circuit. What is its resistance?

$$R = \frac{E^2}{W} = \frac{48,400}{1000} = 48.4 \text{ ohms, or}$$

$$R = \frac{W}{I^2} = \frac{1000}{20.61} = 48.5 \text{ ohms}$$

These relations apply only to direct current, and non-inductive alternating-current circuits.

3. Power factor:

$$\text{Power factor} = \frac{\text{True Power (or Watts)}}{\text{Apparent Power (or Volt-amperes)}}$$

Example: A wattmeter in a 220-volt single-phase circuit shows 12,475 watts. An ammeter reads 66 amperes. What is the power factor?

$$\text{Power factor} = \frac{\text{Watts}}{\text{Volt-amperes}} = \frac{12,475}{14,520} = 0.85$$

(Continued on page 170)

Latest news on controlling RUST and CORROSION

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9 quick facts about TOTRUST

1. Just TOTRUST safely accomplishes that second painting you need.
2. Solid rust — safely painted over, without all scale.
3. Damp surfaces — or dry — take TOTRUST.
4. Galvanized metal — new or old — easily painted.
5. Chemical fumes and salt air — resisted.
6. Elasticity — from 100° below 0° F. to 300° above.
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9. Excellent replacement for aluminum (Light Gray TOTRUST).
10. Exterior painting — safely done even in freezing weather.

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HEAVY DUTY
For surfaces subject to extreme abrasion or weathering. Ideal replacement for critical enamels and lacquers. 14 colors to match original equipment.

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"By standardizing on TOTRUST *we have reduced our monthly replacement of corroded metal from 9000 pounds to 5000 pounds."*
—A well-known chemical manufacturer

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RUSTED OR CLEAN — DAMP OR DRY!

EVEN thorough wirebrushing can't remove rust pits. But TOTRUST penetrates even the deepest rust pits — expels moisture — seals in and around rust particles — thus stops rust at its source.

For over fifteen years The Wilbur & Williams Company has pioneered in rust prevention. So outstanding have been the results that the roster of TOTRUST users reads like a blue book of American industry.

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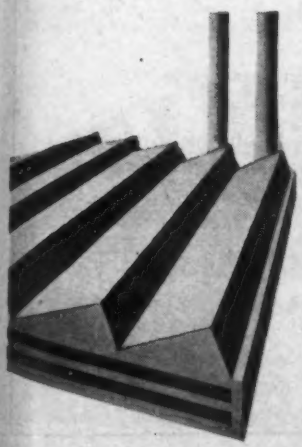

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Handy Formulas for Electrical Work (Continued from page 168)

4. Power in a.c. circuits:

(*a*) For single-phase circuits:

$P = E \times I \times P.f.$, where

P = Power, in watts

E = Volts

I = Amperes

$P.f.$ = Power factor

Example: Voltage at the load is 115, an ammeter reads 27 amperes, and the power factor is 0.88. What is the actual load?

$P = E \times I \times P.f. = 115 \times 27 \times 0.88 = 2732$ watts = 2.73 kilowatts

(*b*) For balanced two-phase circuits:

$P = 2E \times I \times P.f.$

Example: On a 220-volt circuit the current draw is 50 amperes. Power factor is 0.80. What is load?

$P = 2E \times I \times P.f. = 440 \times 50 \times 0.80 =$ 17,600 watts = 17.6 kilowatts

(*c*) For balanced three-phase circuits:

$P = 1.73E \times I \times P.f.$

Example: On a 440-volt circuit an ammeter reads 40 amperes on all three phases. Power factor is 0.80.

$P = 1.73E \times I \times P.f. = 761.2 \times 40 \times 0.80 =$ 24,358 watts = 24.36 kilowatts

5. Power loss in a conductor:

$$P = \frac{12 \times I^2 \times L}{Circ.\ mil.}$$ where

P = Loss in watts

12 = Ohms resistance of a circular mil-foot of commercial copper wire at 50 degrees Centigrade (122 degrees Fahrenheit)

I = Current in conductor in amperes

L = Length of conductor in feet

Circ. mil = Area of conductor in circular mils

Example: How much power will be lost in a copper wire 1000 feet long, having an area of 4107 circ. mil, and carrying a current of 12 amperes?

$$P = \frac{12 \times I^2 \times L}{Circ.\ mil.} = \frac{12 \times 144 \times 1000}{4107} =$$ 420.7 watts

6. Power loss in a circuit

(*a*) For a two-wire d.c. or single-phase circuit:

$$P = \frac{2 \times 12 \times I^2 \times L}{Circ.\ mil}$$

(*b*) For a four-wire, two-phase balanced circuit:

$$P = \frac{4 \times 12 \times I^2 \times L}{Circ.\ mil}$$

(*c*) For a three-wire, three-phase balanced circuit:

$$P = \frac{3 \times 12 \times I^2 \times L}{Circ.\ mil}$$ where

P = Power loss in watts in the circuit

12 = Ohms resistance of a circular mil-foot of copper conductor

I = Current in amperes flowing in each wire of the circuit

L = One-way length of circuit

(It is assumed that the a.c. circuits are reasonably short, the loss small, and that the conductors are close to each other. Therefore, the effect of reactance has been disregarded.)

7. Voltage drop in circuits:

(*a*) For two-wire d.c. circuits and

(*b*) For two-wire single-phase circuits (neglecting effect of inductance):

$V = 2R \times L \times I$, or $V = \frac{2K \times L \times I}{Circ.\ mil}$ where

V = Volts drop in circuit

R = Resistance of wire in ohms per foot

L = One-way length of circuit in feet

I = Current in amperes

K = 12 for circuits carrying more than 50 percent of permissible current

K = 11 for circuits carrying less than 50 percent of permissible current.

Circ. mil = Area of conductor in circular mils

Example: A d.c., No. 12 wire, circuit 180 feet long carries 12 amperes. What is the voltage drop?

$V = 2R \times L \times I = 0.0033 \times 180 \times 12 =$ 7.1 volts, or

$$V = \frac{2K \times L \times I}{Circ.\ mil} = \frac{22 \times 180 \times 12}{6530} = 7.3 \text{ volts}$$

(*c*) For four-wire, two-phase circuits (neglecting effect of inductance): Consider as two separate single-phase circuits and calculate voltage drop by the formulas given in (*b*)

(*d*) For three-wire, three-phase circuits (neglecting effect of inductance): The voltage drop will be 0.866 times the drop in a two-wire d.c. circuit, calculated as shown in (*b*), carrying the same current as the three-phase circuit. That is,

$$V = \left(\frac{2K \times L \times I}{Circ.\ mil.}\right) \times 0.866$$

(*e*) For four-wire, three-phase circuits (neglecting effect of inductance). With a balanced load the drop to a single-phase load (between the neutral and one outside wire) will be one-half the drop calculated as shown in (*b*). That is:

$$V = \left(\frac{2K \times L \times I}{Circ.\ mil.}\right) \times 0.5$$

The drop to a three-phase load will be the drop between any two outside wires, which is equal to 0.866 times the drop of a d.c. two-wire system carrying the same current . That is:

$$V = \left(\frac{2K \times L \times I}{Circ.\ mil.}\right) \times 0.866$$

8. Relations between horsepower and torque:

(*a*) $Hp = \frac{6.28 \times S \times T}{33{,}000}$

(*b*) $T = \frac{Hp. \times 33{,}000}{6.28 \times S}$ where

Hp = Horsepower

S = Speed in revolutions per minute

T = Torque in pounds-feet

Example: A motor develops a torque of 46 pounds-feet at 1150 r.p.m. What is the horsepower?

$$Hp = \frac{6.28 \times S \times T}{33{,}000} = \frac{6.28 \times 1150 \times 46}{33{,}000} =$$ $\frac{332{,}212}{33{,}000} = 10$ horsepower

Example: What is the torque of a 5-hp., 1750-r.p.m. motor at full load?

$$T = \frac{Hp. \times 33{,}000}{6.28 \times S} = \frac{5 \times 33{,}000}{6.28 \times 1750} = \frac{165.000}{10{,}990} =$$ 15 pounds-feet

STRENGTH IS IMPORTANT

. . . BUILD WITH TIMBER STRUCTURES

CLEVELAND. 200′ laminated trusses were designed, prefabricated and erected by Timber Structures, Inc. for 200′x440′ assembly plant, for The U.S. Engineers. Front trusses, (supporting doors and roof), were built to carry 450,000 lbs. Intermediate trusses built to carry 310,000 lbs.

PORTLAND. Steel warehouse for Woodbury & Co. The roof of this 200′x 300′ building is supported by 35-67′ trusses, 15 lb. dead load, 40 lb. live load, plus 14,000 lb. concentration at center line of bottom chord and adjacent to each end of the truss. Concentration supports a three-point suspended traveling crane. Architect: Richard Sundeleaf. Contractor: Wegman & Son.

PITTSBURGH. Fleming Park Bridge—756′ (six 126′ spans) was built for 12-ton trucks and 30-ton street cars. Designed by Allegheny County, Pennsylvania. Detailed, prefabricated by Timber Structures, Inc. Erected by J. F. Casey Co., Inc. and McCrady Construction Co., Aspinwall, Pa. Verne Ketchum, Engineer for Timber Structures, Inc.

ROOF TRUSSES and other items prefabricated by Timber Structures, Inc. embody the natural strength of wood plus connection strength of modern timber connectors. So strong, in fact, are laminated timber members, that they are being used in structures where previously only steel girders were considered practical.

Strength is important, yet it is but one of the features of Timber Structures products. Other advantages are ready source of materials, speed of construction, economy and permanence.

This organization has rendered years of service to contractors, architects, engineers, plant management in prefabricating roof trusses for buildings of all kinds and sizes for every major industry. We invite inquiries as to work performed and as to our ability to serve you in timber or other structural materials. For evidence of work we have done please use the coupon below or write direct for literature.

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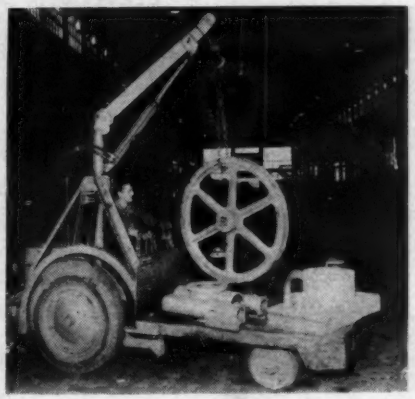
Tractor Crane

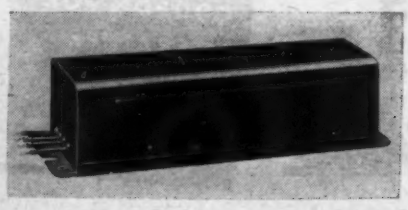
Hydraulic operation and steering is featured in Drott Go-Devil tractor crane, powered by a 4-cyl., 16-hp. gasoline engine for indoor or outdoor service in lifting, loading, transporting, and unloading. Positive hydraulic up-and-down power enables boom to handle loads up to 2000 pounds, and outriggers prevent tipping under heavier loads. Boom swings a full 360 degrees, has an extension to 90 inches, and reaches to a height of 14 feet, 2 inches. A hoist worm-and-wheel lock arrangement is



used instead of clutches and brakes for all lifting and swinging operations. All controls are within operator's reach. Tractor has large pneumatic tires and small solid front tires that provide sufficient traction for steep grades. Steering is said to be without effort under all load conditions. Turning radius is 10½ feet, and traveling speeds are up to 7 miles per hour. Platform loading space is 20 square feet. Pusher plates and drawbars at both ends of unit provide for pushing and towing work. Special platform sizes, boom lengths, and heights also are available. Hi-Way Service Corp., 3841 W. Wisconsin Ave., Milwaukee 8.

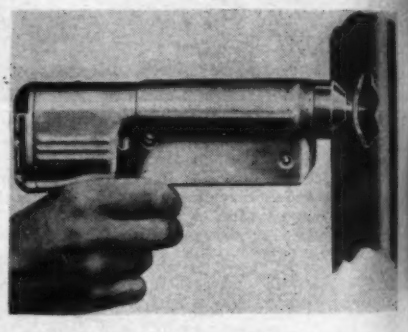
Ballasts and Sockets

Ballast for cold cathode fluorescent lighting is announced. It lights two 40-watt tubes with a power consumption of 105 watts operating from 115-volt a.c. lighting system, and incorporates a transformer, two reactors, and a capacitor, which are inclosed in a case 2½ x 3⅛ x 9½ inches, weighing a total of 9 pounds. Power factor is approximately unity, and lighting of tubes is said to be accomplished without use of starter on line voltages as low as 100 volts without a flicker. For the same system, 2- and 4-lamp sockets have been developed which permit installation of tubing in fixtures or for direct ceiling lighting. One of the sockets has a built-in disconnect switch that opens the circuit when the cover is removed. Jefferson Electric Co., Bellwood, Ill.



Rivet Driver

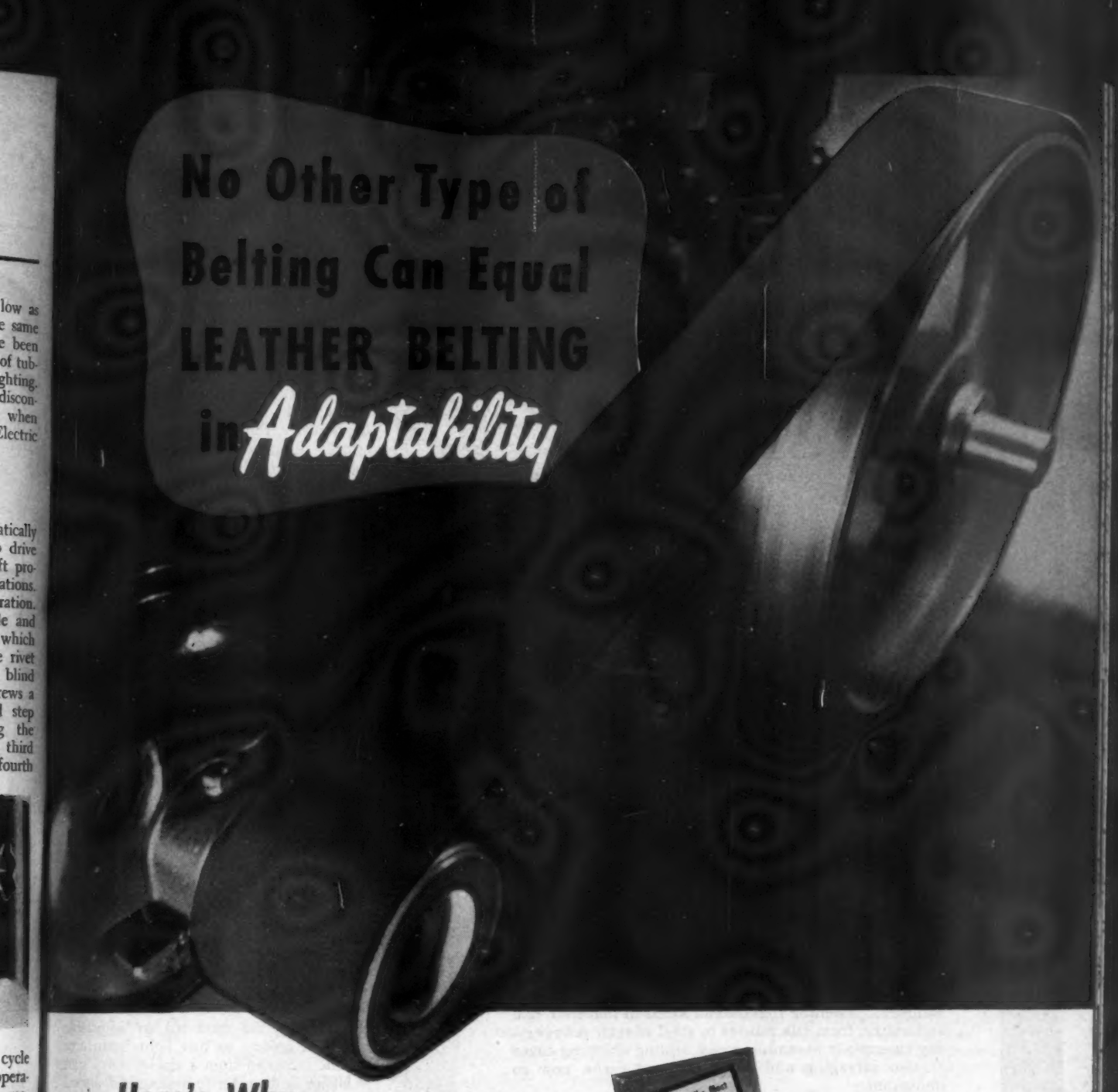
Known as Thor Riv-Driver, pneumatically operated tool is stated by maker to drive four blind rivets a minute in aircraft production and in similar assembly operations. It will drive and buck in one operation. The tool operates in a 4-step cycle and features a light at the top of handle which flashes "OK" to indicate when the rivet has been accurately upset on the blind side. The first step in the cycle screws a mandrel into the rivet; the second step pulls back the mandrel, upsetting the rivet and flashing the light; the third step unscrews the mandrel; the fourth



shuts off the tool, completing the cycle and making it ready for the next operation. Weighing only 4¼ pounds, the machine measures 9½ inches in length, has a spindle offset of ⅞ inch, and a speed of 1000 r.p.m. forward and of 2000 r.p.m. reverse. Independent Pneumatic Tool Co., 600 West Jackson Blvd., Chicago 7.

Safety Clothing

Sta-Safe Eyemask is now available in one-piece, all-plastic design that provides ventilation through perforations above and below the vision area. Maker claims other features, (1) unusual impact resistance, (2) weight not over 2 ounces, (3) cover goggle practicality, (4) non-flammability, (5) availability in clear or green anti-glare models. A companion accessory is the Sta-Safe Hairguard No. 18, resembling French Foreign Legion headgear, and designed to cover all hair, with visor that acts as a bumper. Maker states it can be cleaned, is adjustable, lightweight, and cool. Available in ivory or blue, with red, blue, green, or white trim around visor, which can be imprinted with trademark,



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Leather Belting is more adaptable to varying drive conditions than other types of belting. It will also transmit power effectively over a wider range of speeds and tensions.

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The authoritative booklet, "How To Get The Most From Your Leather Belting," contains a lot of factual information that will help you to make a few sizes meet your needs.

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Horsepower Rating Tables ..... Page 8
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THIS IS the question asked by many customers ... surprised by the wide adaptability of Bostitching in speeding production ... from fastening fragile glass bottles onto display cards ... to stitching heavy gas tanks. "What next!" is the question we are *all* asking ourselves as war conditions improve and new production opportunities loom in sight.

Bostitching can solve many fastening problems ... saving valuable time over welding, riveting, gluing, nailing ... fastening together all kinds of material, like and unlike, from silk fabrics to steel sheets. An everyday example is assembling and sealing shipping cases ... also salvaging and repairing used cases, now so important.

"What next!" Although Bostitch products are still engaged in war work all over the world, we are planning *now* with our customers for better days:

New Bostitch "When-Available" Plan

... will help *you* to prepare and help *us* to plan for the revival of civilian industries. Send for details.

Bostitch (Boston Wire Stitcher Company), 68 Blackmore Street, East Greenwich, R. I. (Bostitch-Canada, Ltd., Montreal).

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fastens it better AND FASTER with wire

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ALL TYPES OF MACHINES FOR APPLYING STAPLES

departmental number, or emblem. Standard Safety Equipment Co., 232 West Ontario St., Chicago 10.

Arc Welding Spotlight

Where quick and accurate establishment of arc must be made, spotlight is designed to provide glareless illumination of sufficient intensity for operator to see work distinctly through dark lens of welding helmet prior to striking arc. Lifting of helmet between operations is not necessary, thereby increasing production by saving time and reducing operator fatigue. Light is controlled by a foot-operated switch that is depressed by the operator while the arc is struck. Mounted on upright telescoping metal standard with 18½-in. diameter, 30-lb. cast-iron base, the spotlight consists of

three 300-watt reflector spot lamps surrounded by a circular shade. Rated to give 1000 hours continuous operation at 120 volts, lamps are mounted in adjustable porcelain holders so that light beam area can be increased from a single, sharp spot 7 inches in diameter to a cloverleaf-shaped pattern approximately 17 inches across at its widest point. Height of the light can be adjusted to any point from 45 to 76 inches above the base, and light can be directed at any angle downward between vertical and 30 degrees below horizontal. General Electric Co., Schenectady.

Cold Medicament

Iodo-lin preparation is offered for combating the effects of the common cold, influenza, and sinus conditions of employees, to reduce loss of man-hours in industry. It is claimed to have the effect of aborting the early symptoms of a cold, including dry nose, stuffiness, headache, and other distress. Manufacturer states it also apparently overcomes the early symptoms of influenza when used soon enough. In sinus conditions it is claimed to give relief of congestion and headache in 50 to 70 percent of the cases, because of marked liquefaction and drainage almost immediately after application. Treatment is

ONLY AN ELECTRICAL WHOLESALER COULD THUS SPEED WAR PRODUCTION

Wesco effected pilot control of motors

Radical Use of Motor Starters Ended Sub-Chaser Space Problem; Saved 67% of Cost.

Installed in the sub-chaser were two ¾ h.p. direct current motors. The plan called for control of the motors from the pilot house but the space was too cramped to contain the standard direct current starters, each of which was 12" wide, 11⅞" deep and 14" high. Wesco engineers suggested a radical idea—the use of a type of linestarter employed in industrial plants. This starter is 4⅝" wide, 3⅞" deep and 7¼" high, and occupies only 1-15th the cubic bulk of the conventional starter.

The Navy engineers were dubious, but Wesco made a satisfactory demonstration and won approval. Not only were the two small starters easily accommodated in the pilot house but, since they cost $6.50 each instead of $20.00, the Navy saved $13.50 on each starter plus a quantity of critical materials.

The ability to find practical and efficient solutions to seemingly impossible problems, has featured Wesco's speed-the-Victory service to war plants, the Army and the Navy. That ability will be at your command in 194X.

WESCO SPEEDS WAR PRODUCTION

* 190 separate electrical items, involving 45 manufacturers, were required for two 110-foot sub-chasers. Wesco ordered, assembled, and delivered each set of 190 units at a great saving in time and labor.
* Tie-up of a vital war plant was prevented when Wesco supplied 15 types of an "unobtainable" product —24 hours after receiving the order!

• • •

WESCO SERVES BUSINESS

* By knowing local and national codes and rulings.
* By furnishing informative and technical data.
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SPEED OUR VICTORY
BUY WAR BONDS

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Essential data on the installation, operation and maintenance of modern pumping equipment. Prepared by Blackmer engineers for those who buy and use rotary pumps.

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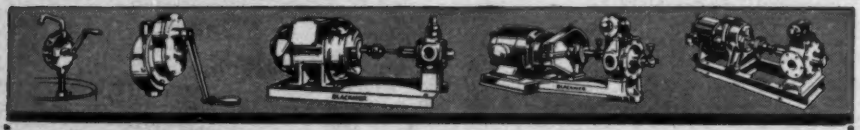

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practically painless and does not involve taking worker away from job. Iodo-lin is available in 30- and 60-cc. vials. Lincoln Laboratories, Inc., Industrial Division, 113 S. Oakland Ave., Decatur 32, Ill.

Pushbutton Units

Line of standard-duty pushbutton units is offered for flush or surface mounting on machine tools, welding controls, and similar equipment. Available in both pendant and oilproof types, units are made of smooth, hot-molded, moisture-resisting phenolic compound. The buttons are large in diameter and slightly concave to fit the tip of the finger. Responsive double-break

contacts are of fine-silver and have a steel back projection, protected by rust-resisting plating, welded to the contact supports. Small size of units permits mounting several of them in a relatively limited space. The oilproof units are similar to pendant type except that they are provided with an especially treated leather ring packing, moving back and forth with the button, that serves to wipe the oil from the surfaces from which it might otherwise seep into the mechanism. Both pendent and oilproof types can be obtained with buttons of various colors and with interchangeable, labeled nameplates for easy identification. Accessories offered for use with these units include a long button for applications requiring a button ½ inch longer than standard; a removable snap-on mushroom head for quick selection; and a tamper-proof locking attachment for preventing operation by unauthorized persons. Industrial Control Div., General Electric Co., Schenectady.

Paint Stick

"Paintstik B" marker is announced for use on wet, icy, sleek or oily metal surfaces on which it is difficult to make distinct, lasting markings with ordinary

MASTER

COMBINED OPERATIONS

This war has proved to our military staff that there is one best way to do a sure-fire job . . . "combined operations" of picked units from the army, navy, marine and air corps operating as a hard hitting, integral task force.

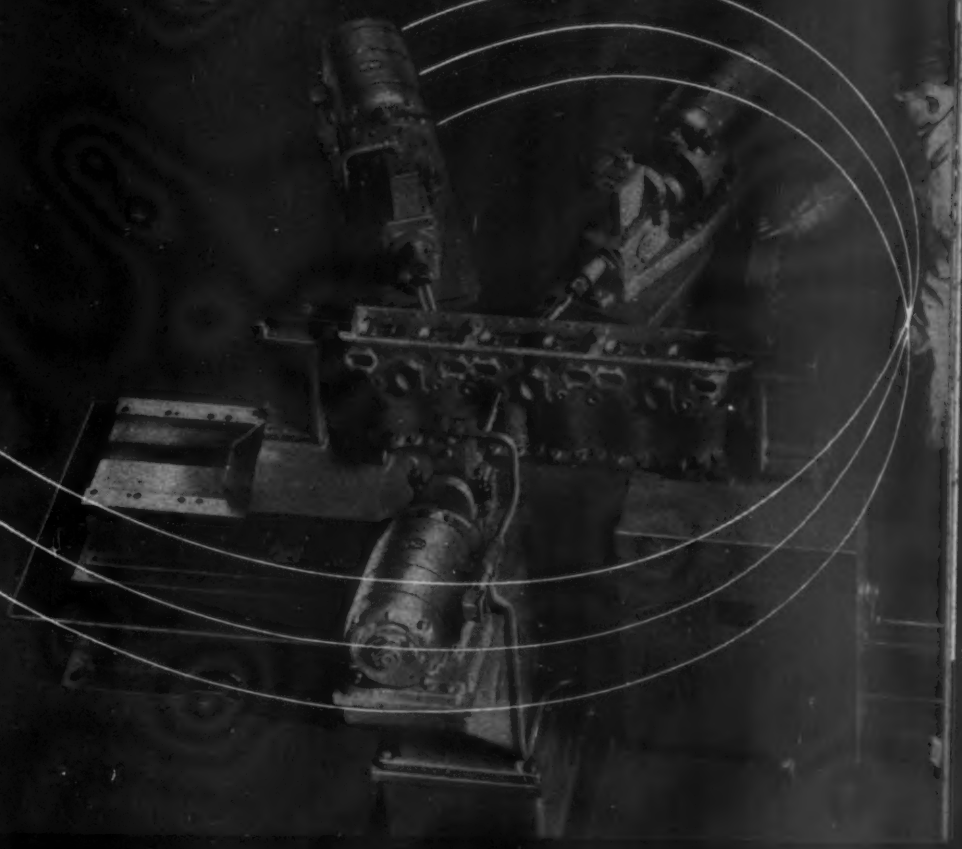
And you will find that the wide flexibility of the Master line of electric motor drives makes it possible for you to use the same tactics.

For example, the power drives on the machine below combine a motor, a gear reduction and an electric brake . . . all in one compact, integral, task force unit. These drives could also include the Master Speedranger for variable speed operation and can be supplied in enclosed, splash proof, fan-cooled or explosion-proof construction and with their construction so modified that the mounting possibilities are practically unlimited.

This wide flexibility in a compact integral construction saves space . . . saves a large part of your assembly and mounting costs . . . eliminates many unneeded parts . . . saves you a lot of time and money.

When you need motors for your plant or your product, investigate Master's unusual ability to help you improve the economy, compactness and appearance of your motor driven equipment with task force power units.

THE MASTER ELECTRIC COMPANY • DAYTON 1, OHIO



DUST CONTROL
MEANS ECONOMY
ON THE PRODUCTION FRONT

• Dust Control, effecting worthwhile savings in time, labor and materials, has been accepted as a great economy factor on the production schedules of modern industrial plants. The thirty-five years' experience and progress which give to Pangborn the leadership in the field of Modern Dust Control are successfully applied day after day—in almost as many different ways as there are industries.

• At a plant located in the heart of one of our great industrial cities—specializing in work which creates a vast amount of dust—effective Dust Control had long been desired but, in spite of extensive installations for the purpose, the problem could not be solved. Corrective results were recently achieved with a small Pangborn cloth screen Dust Collector which was installed in conjunction with the customer's entire collection system.

• Because of the outstanding success of this initial installation, the company decided to purchase the larger unit which is pictured above. After a short period, they equipped their eastern plant with similar collectors and have now ordered *four more* units for their main plant.

• This standardization on Pangborn equipment, based on actual operation experience, is proven evidence of the value that progressive management places upon the economy of effective Dust Control as obtained through Pangborn equipment and engineering service.

Send today for your copy of our new bulletin #909 which will help you to visualize the savings you can effect through Modern Dust Control.

ARMY E NAVY

PANGBORN

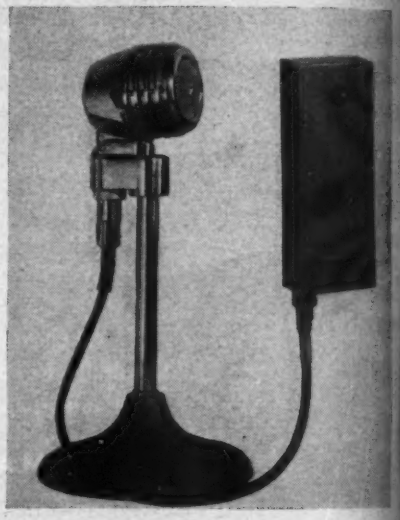
WORLD'S LARGEST MANUFACTURER OF DUST COLLECTING AND BLAST CLEANING EQUIPMENT

PANGBORN CORPORATION • HAGERSTOWN, MD.

marking materials. It is said to be particularly adaptable to steel surfaces under these adverse conditions. Maker states it can be used in place of paint and brush in layout departments, fabricating shops, yards, and similar places where weatherproof, fadeproof and permanent markings are required. Marker is available in a variety of colors for easy identification purposes as well as for piecework marking. Markal Co., 6 E. Lake St., Chicago.

Microphone Control Box With Busy Signal

Model P566 relay and busy signal control box is for connection to microphones in Executone's rack and panel amplifier sound systems. Installed with microphones in such locations as guardhouses, reception desks, telephone switchboard, and at plant broadcasting centers, it coordinates the operations of multiple microphones and provides an instantaneous method of cutting in on central plant sound systems.

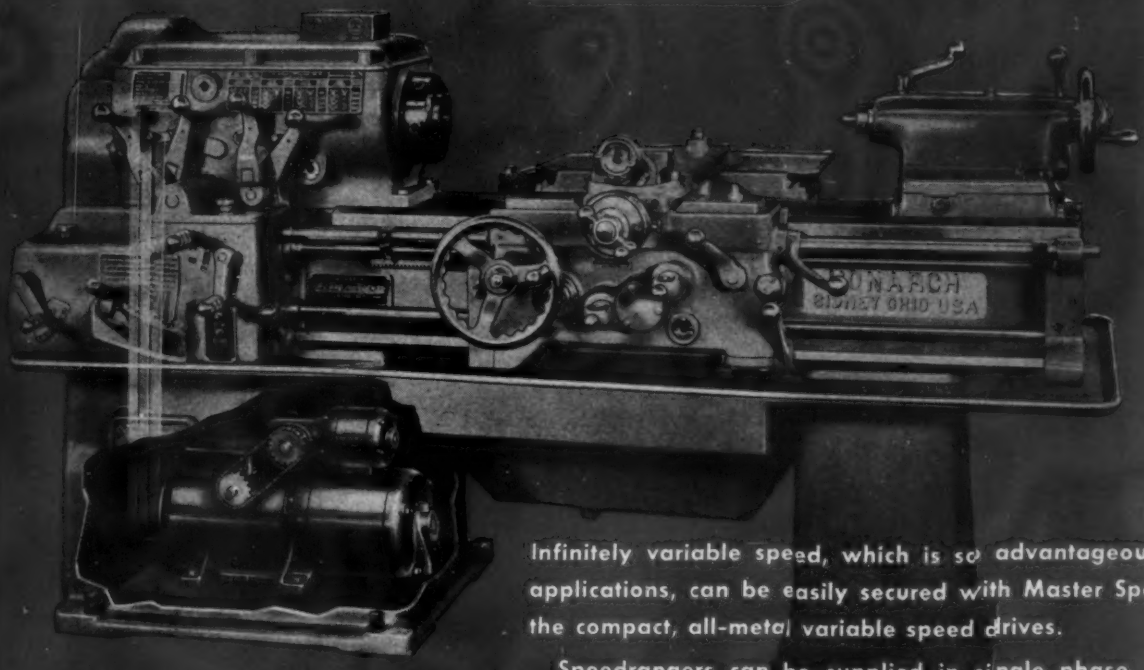


Busy-signal light eliminates interruption from other microphones in the same system. Talk-switch prevents accidental broadcasting of unwanted sounds, provides automatic plate voltage relay control, thus reducing wear on amplifiers, and automatically cuts off music broadcasting when paging is desired. Suitable for wall mounting, the unity is housed in gray crackle finished metal cabinet, 6½ x 2⅝ x 1⅜ inches. Connections are made to terminal strips located inside the case. Executone, Inc., 415 Lexington Ave., New York 17.

Cutting Lubricant

Cooling as well as lubricating properties are claimed for cutting solution, named Hydromite. Product is not an oil or a soluble oil, but a true water solution that is transparent and practically colorless. It has extreme oiliness, high film strength, and anti-welding properties. Greater cutting speeds are said to be allowable because lubricant dissipates heat faster, and gets to the point of work quickly because of its low viscosity. Hydromite comes in concentrated form and is diluted to correct strength for the individual job by addition of water. It is said to have no strong

MASTER SPEEDRANGERS



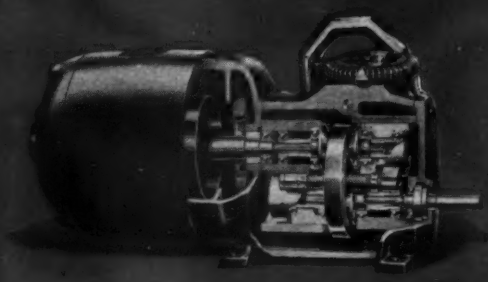
Infinitely variable speed, which is so advantageous on many applications, can be easily secured with Master Speedrangers, the compact, all-metal variable speed drives.

Speedrangers can be supplied in single phase, polyphase, direct current, gearhead, unibrake, open, enclosed, splash-proof fan-cooled and explosion proof construction and with many types of mounting.

No other variable speed unit can give you such flexibility and compactness.

VARIABLE SPEED *at the flip of a switch*

The Master Speedranger shown above is equipped with electric remote control, with the control motor an integral part of the construction. The complete unit slips easily into place, saves mounting time and expense, eliminates many unneeded parts and greatly simplifies changing speeds.



The unit illustrated operates a lathe but it's use is just as advantageous on many other machine tools, mixers and agitators, reeling equipment, material processing, handling and conveying equipment . . . to name only a few.

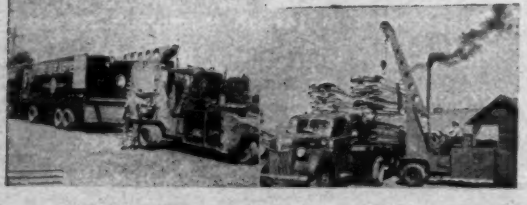
Investigate what a really remarkable job Master Speedrangers can do for you.

THE MASTER ELECTRIC COMPANY • DAYTON 1, OHIO

The handiest rig on the place . . .

HYSTER KARRY KRANE
REG. U. S. PAT. OFF.

a self propelling general utility crane with a thousand uses . . .



A HIGHLY MANEUVERABLE crane for working in crowded areas either inside on floors or outside in gravelled storage yards.

TRUNNION STEERING enables it to turn in its own length. Pivoting around the front wheels gives it the effect of a swinging boom —for accurate spotting—with the simplicity and strength of a fixed boom.

FULL REVERSING TRANSMISSION with four speeds both forward and reverse permits driving backward as easily as forward—full view regardless of load.

LOAD CAPACITY up to 10,000 pounds.

Deliveries now must necessarily be restricted to war orders but if your plant is in war work and a HYSTER Karry Krane will speed up your production, get in touch with the nearest HYSTER office listed below for detailed information on its adaptability to your needs and on delivery.

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Manufacturers of TRACTOR WINCHES, DOUBLE DRUMS, CRANES AND LOGGING ARCHES STRADDLE TRUCKS, LIFT TRUCKS, KARRY KRANES

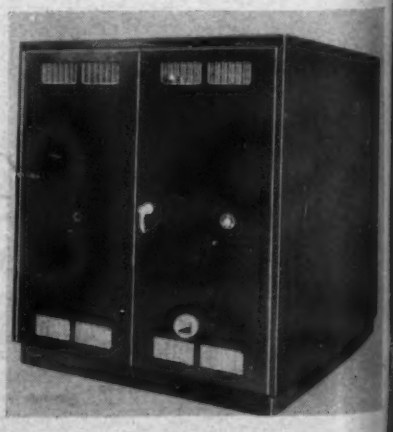
objectionable odor, does not smoke in use, is easily removable from work, and drains well from chips, giving maximum economy. Filmite Oil Corp., Station K, Milwaukee.

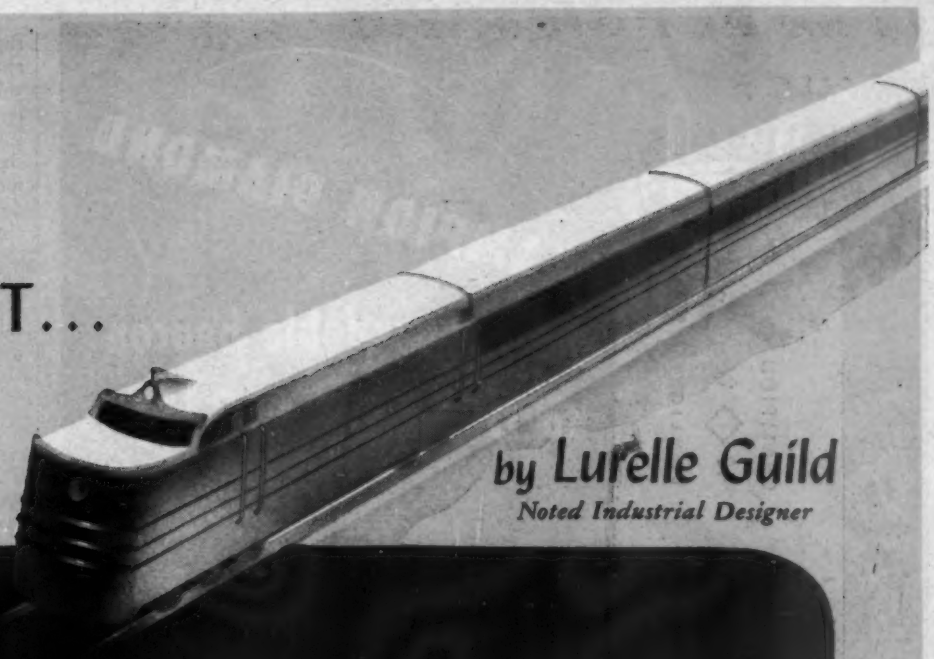
Signaling Timer

Series S signaling timer is designed to command visual and audible attention the instant a desired time interval is completed. When pointer is manually set to required interval shown on the dial, a circuit is closed, operating a pilot light that indicates that the time interval has started. Moving pointer revolves counterclockwise toward zero, and exact elapsed time is shown on dial at any time. Upon completion of interval, an audible alarm sounds and the pilot light goes out. Buzzer continues to sound until switch is snapped off or timing interval is again started. Extra socket can be provided in timer case for connection of additional lights or alarms. Case is of black metal, 5x5x3¼ inches, and readily attachable to wall, panel, or standard switchbox. Timers are available for 115 to 230 volts a.c., and 25, 50, or 60 cycles, at 1000-watt rating. Dial calibrations vary from 1 second to 5 minutes, depending on the choice of maximum intervals that are available in ranges from 1 minute to 3 hours. Industrial Timer Corp., 117 Edison Place, Newark, N. J.

Circuit Breaker

Large air circuit breakers in individual metal enclosures are announced for public utility and heavy industrial service. Known as type LG, they are available in ratings from 2000 to 10,000 amperes, with inter-





I PREDICT...

by Lurelle Guild

Noted Industrial Designer

The railroad car of tomorrow will make today's de luxe cars resemble the stage coach by comparison. I have designed for one of the country's largest railroads a train embodying numerous new and practical features including super-efficient heating and cooling systems to eliminate dust, germs and draft. Coach passengers will have club car comforts. You'll experience the restful quietness of acoustically-correct, fabric-coated walls; color-corrected, cold cathode lighting with pinpoint lights to spotlight at night the individually reclining seats that will face the windows. Your luggage will be safely secured in individual lockers and all cars will be wired for sound and telephone connections. Yes, your War Bonds will buy you many delightful experiences on the railroad trains of tomorrow.

Note: The Weatherhead Company, exclusive American manufacturer of Ermeto fittings, made vital parts and assemblies for the railroad industry in its four plants prior to Pearl Harbor. We hope to contribute our services and facilities to this important industry again after Victory is ours.

Look Ahead with

Weatherhead

THE WEATHERHEAD COMPANY, CLEVELAND, OHIO

Manufacturers of vital parts for the automotive, aviation, refrigeration and other key industries.

Plants: Cleveland, Columbia City, Ind., Los Angeles
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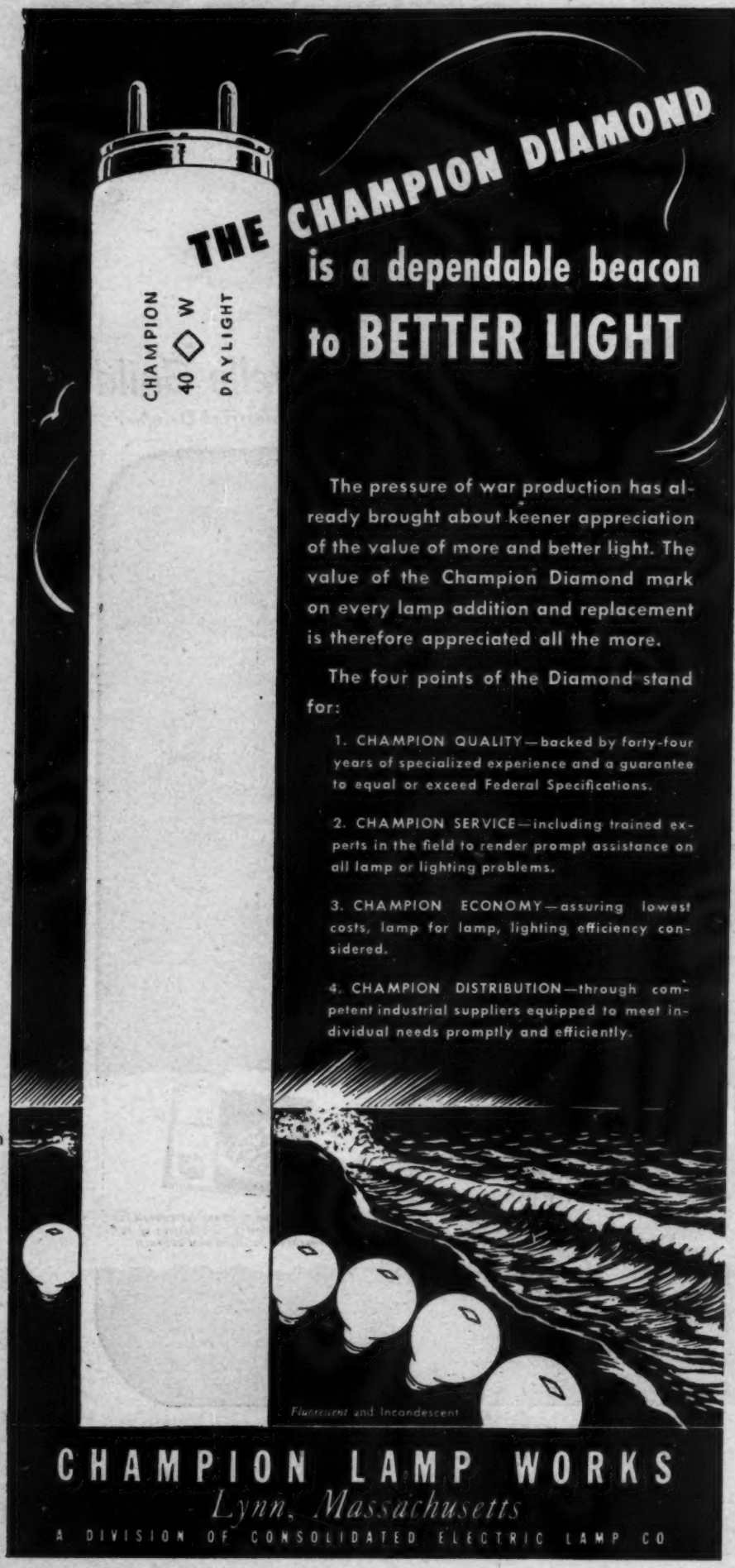
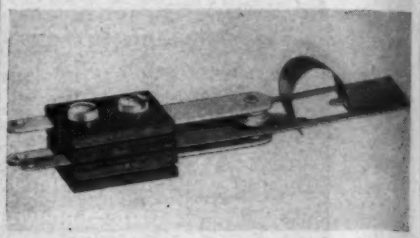
FREE: *Write on company letterhead for "Seeds Of Industry"—a history of the Weatherhead facilities and products.*


THE CHAMPION DIAMOND
is a dependable beacon
to BETTER LIGHT
CHAMPION
40 ◇ W
DAYLIGHT
The pressure of war production has already brought about keener appreciation of the value of more and better light. The value of the Champion Diamond mark on every lamp addition and replacement is therefore appreciated all the more.
The four points of the Diamond stand for:
1. CHAMPION QUALITY—backed by forty-four years of specialized experience and a guarantee to equal or exceed Federal Specifications.
2. CHAMPION SERVICE—including trained experts in the field to render prompt assistance on all lamp or lighting problems.
3. CHAMPION ECONOMY—assuring lowest costs, lamp for lamp, lighting efficiency considered.
4. CHAMPION DISTRIBUTION—through competent industrial suppliers equipped to meet individual needs promptly and efficiently.
Fluorescent and Incandescent
CHAMPION LAMP WORKS
Lynn, Massachusetts
A DIVISION OF CONSOLIDATED ELECTRIC LAMP CO

rupting ratings of 75,000 and 100,000 amperes. Standard voltage ratings are 600 volts a.c. and 250 volts d.c. Operation may be either manual or electric. The enclosures are built of heavy-gage, bonderized sheet steel, and can be supplied for either indoor or outdoor service. Either type is designed to give full protection for the circuit breaker, which may be opened or closed without opening enclosure. Large doors at front and rear provide access to breaker and connection studs. Connecting cables may enter the enclosure at the top, bottom, or sides. I-T-E Circuit Breaker Co., 19th & Hamilton St., Philadelphia 30.

Snap-Action Switch

To secure better contact pressure and greater speed of operation, small open-blade snap-action switch has been developed. It is intended for a wide variety of applications including machine-tool control



devices and for construction of various relays and contactors. The patented rolling spring is designed to produce a positive snap action with less than 6-oz. operating pressure, and is said to minimize contact burning because of its extremely fast action. Switch is also designed to permit both pre-travel and over-travel, and has a rating of 15 amps. on 125 volts a.c. Overall size is $3\frac{1}{16} \times 1\frac{1}{16} \times \frac{1}{2}$ inches. Made in single pole, single or double throw, set and return types. Acro Electric Co., 1309 Superior Ave., Cleveland.

Stencil Ink

Non-settling and non-clogging properties are claimed by the maker of D-B stencil ink for marking cartons, wooden boxes, and burlap. These properties are stated to permit use to the last drop, because of absence of sludge, and to eliminate need for shaking before use. Ink is said to dry instantly and to require little pressure in applying to the stencil. Other claimed advantages are no building up of ink on brush, and no loss of color strength notwithstanding thinness. Ink is available in any standard color. Diagraph-Bradley Stencil Machine Corp., 3745 Forest Park Blvd., St. Louis 8.

Electronic Speed Control

Line of "Eleco RPM" Series 400 controls is available, providing adjustable speed drive from a.c. supply in conjunction with any shunt-wound d.c. motor installation from 1 to 200 hp. Stepless speed ratios are said to be obtainable up to ratio of 20 to 1 at constant torque, and much higher ratios are available at constant horsepower applications. Regulation is

NICHOLSON SAW FILE HOLDERS

(POINT AND TANG HOLDERS)

provide permanently accurate alignments . . . simplify rotating, removing, replacing and positioning of files . . . effect DECISIVE time savings in operating saw filing machines

INSERTING FILE. Push back the spring plunger of the point holder. Insert tang in tang holder; triangular socket engages file on precision surfaces at *shoulder* — not at less carefully forged tang itself. Insert point and release plunger. Position file to proper saw-tooth angle and tighten set screws. *One* positioning does it—for the entire job!

TURNING FILE. Push file forward (compressing plunger) to disengage shoulder end. Rotate file to bring fresh cutting edge into action. Release plunger, letting file spring back into permanently gauged position. Uniformly sharp saw teeth, uniform file wear, maximum file life ensured!

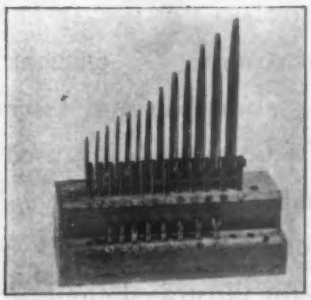
NICHOLSON File Holders for repetitive machine filing (principally saws) are a great improvement over methods which involve infinite making and undoing of adjustments. Note the simple, methodical procedure described above. No hand-and-hammer wedging of file into holders! No "unwedging" or loosening of set screws to turn or remove file! No repeated hand-gauging!

Any filing-machine operator can see for himself the time and money-saving advantages to be gained. Whether the job is filing one saw or a hundred of the same kind and size, one positioning of file and holders is usually sufficient.

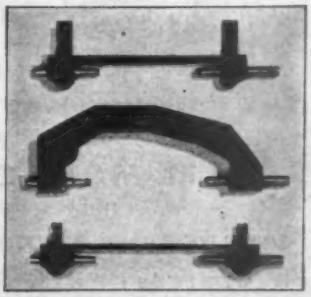
Saw manufacturer, service saw-sharpener, or industrial plant using filing machines—get all the facts. Consult any mill-supply house handling Nicholson or Black Diamond Files—or write us direct stating your particular machine-filing requirements. No obligation.

NICHOLSON FILE CO. • 27 Acorn Street, Providence 1, R. I., U. S. A.

(Also Canadian Plant, Port Hope, Ont.)



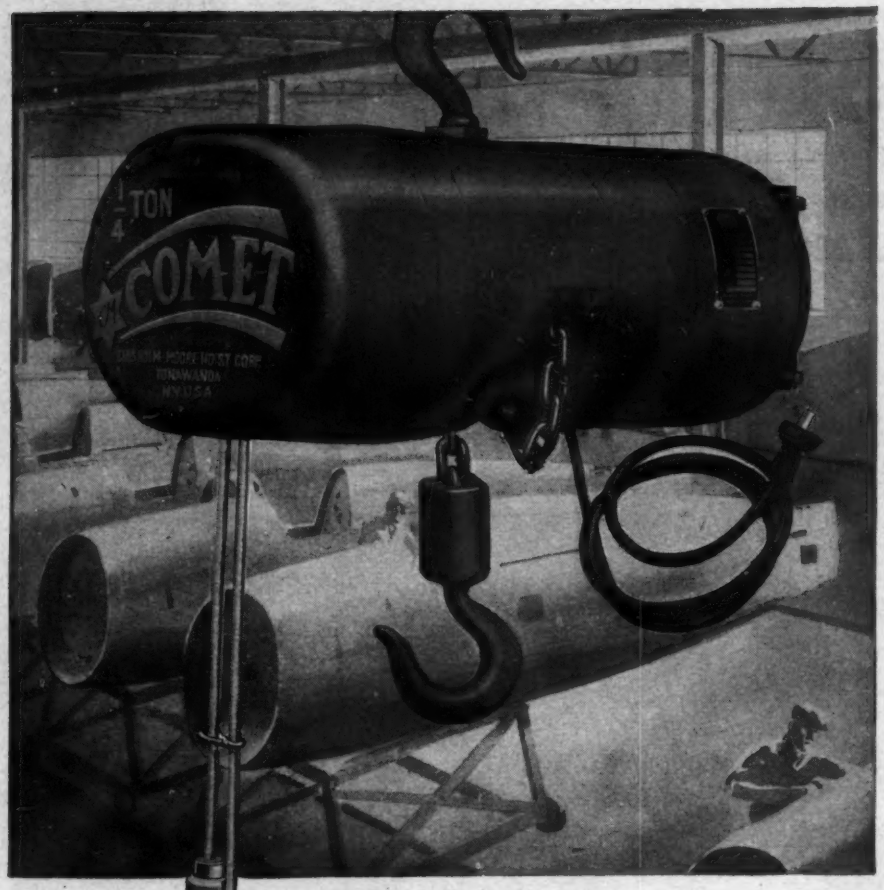
HOLDERS for every size triangular file. **COMBINATION BRACKETS** to fit all standard saw-filing machines — Anderson, Cleveland, Foley, Seigmeister, Wardwell, etc.



NICHOLSON U.S.A. MADE IN U. S. A.

NICHOLSON FILES

FOR EVERY PURPOSE



LIFTING
War Planes on faster schedules

The CM Comet Electric Hoist is helping aircraft and other war industries set faster production schedules through efficient materials handling in practically all stores, fabrication and assembly departments. Durable and fast, the CM Comet is being used on trolleys, monorails, cranes and as a portable unit. *Efficiently operated by new personnel.* The versatile, low-cost, CM Comet will speed-up your production schedules. Write for illustrated engineering catalog No. 138.

CM COMET

★ ★ ★

INVEST REGULARLY IN VICTORY—BUY WAR BONDS AND STAMPS

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CHISHOLM-MOORE HOIST CORPORATION
(Division of Columbus-McKinnon Chain Corp.)

120 FREMONT AVENUE, TONAWANDA, NEW YORK

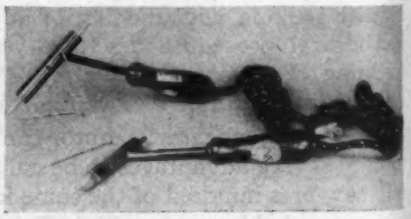
BRANCH OFFICES: NEW YORK • CHICAGO • CLEVELAND

stated to be excellent, with high torque and high efficiency even at very low speeds. Other features may be incorporated, such as dynamic braking, and fast, repeated, and continuous reversing service, also accurate inching control. The electron tubes are of tough industrial type that are said to give long-life, heavy-duty service

with low operating cost. The control is mounted as one unit in heavy steel enclosure that can be easily hung up without necessity of foundation. Control wheel and start-stop buttons may be mounted on machine. Maker claims many advantages, such as elimination of need for mechanical speed reduction units, no transformer required, high power factor, small space requirements. Electron Equipment Corp., Palm Springs, Cal.

Soldering Iron

Featuring an extendable tip that runs completely through center of barrel, Kelnor electric soldering iron provides for adjustment of tip length to suit the job, and also permits substitution of heavy pyramid head when desired. Design is said to allow

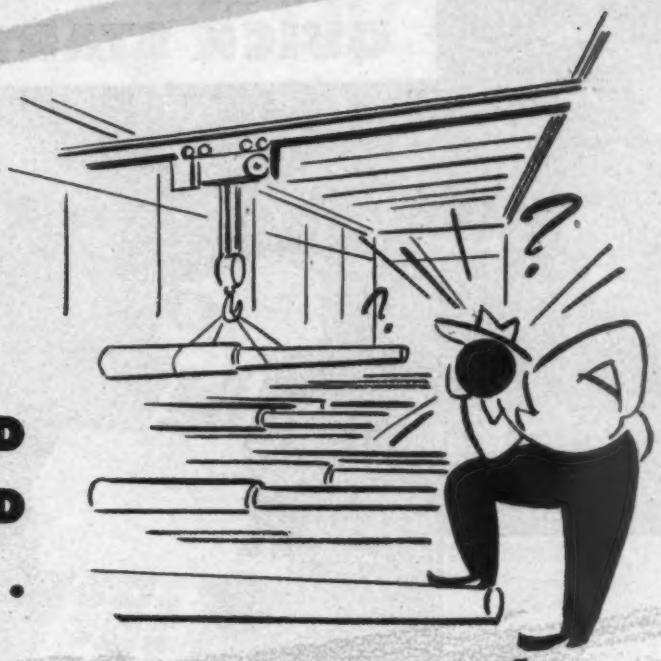


hand to rest in natural, relaxed position while soldering, and to permit working in hard-to-reach places without burning adjacent surfaces. Heating element coils are hermetically sealed in ceramic insulation to obtain indefinite life of element. Plastic handle is designed to remain cool, and weight of only 8 ounces, including 6 feet of heater cord, is said to cut down worker fatigue. Kelnor Mfg. Co., Central Tower, San Francisco 3.

Lighting Fixture

Fluorescent luminaire, named Aristolite, is designed with steel housing within WPB regulations for use in offices, drafting

crippled crane



REJUVENATED BY WEEK-END OPERATION..

ASSEMBLY AISLE OF ARSENAL LEFT WITHOUT CRANE FACILITIES WHEN 100 HP MOTOR–ARMATURE FAILED. ARMATURE DELIVERED TO WESTINGHOUSE DISTRICT MANUFACTURING AND REPAIR PLANT 6:00 P.M. SATURDAY. ARMATURE STRIPPED AND REWOUND, COMMUTATOR REBUILT. ASSEMBLY DIPPED AND BAKED, BALANCED AND TESTED. BACK AT THE ARSENAL 2 P.M. TUESDAY.

Westinghouse

DISTRICT MANUFACTURING AND REPAIR

J-90491

IF **THE EQUIPMENT NEEDING REPAIR IS VITAL TO THE WAR EFFORT . . . PHONE THE NEAREST OFFICE OF WESTINGHOUSE ELECTRIC & MANUFACTURING COMPANY FOR**

EMERGENCY SERVICE

33 M & R PLANTS . . . ONE NEAR YOU!

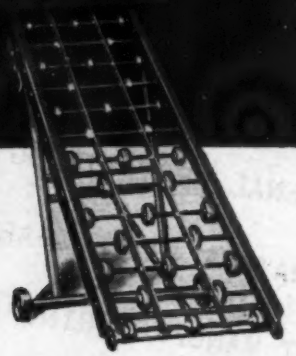
A FASTER SET-UP FOR A QUICK START

Unlock Cam-locks.

Adjust to desired height.

Lock both Cam-locks

Ready for operation.



In war speed is paramount. The Army has proven handling operations can be speeded up by its extensive use of Rapid-Wheel Conveyors. Gravity, not manpower, does the work. . . .

The faster set-up and quick, easy assembly features of the new "Cam-lock" stand makes Rapid-Wheel Conveyors more convenient than ever. Designed especially for the Army and only now have they become available for civilian use. A self-contained unit, the "Cam-lock" stand folds completely under the conveyor, saves storage space, rolls to the job. Provides a full range of adjustments up to 50" operating height.

Rapid-Wheel Conveyors equipped with the new "Cam-lock" stand will give you an entirely new concept of what labor-saving means. Write for full information to **The Rapids-Standard Co., Inc., 5351 Bond Ave., Grand Rapids, 2, Michigan.**

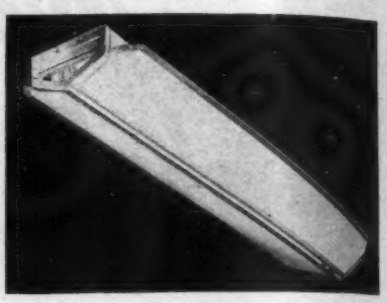
Offices in Principal Cities

RAPIDS-STANDARD

Rapid-Wheel

CONVEYORS

rooms, and other commercial areas. Maker states that special "lens-design" glass of high transmission qualities provides full diffusion of light rays to reduce reflected glare. Glass panels are easily removable for servicing and relamping. End design permits flush abutment of units when continuous



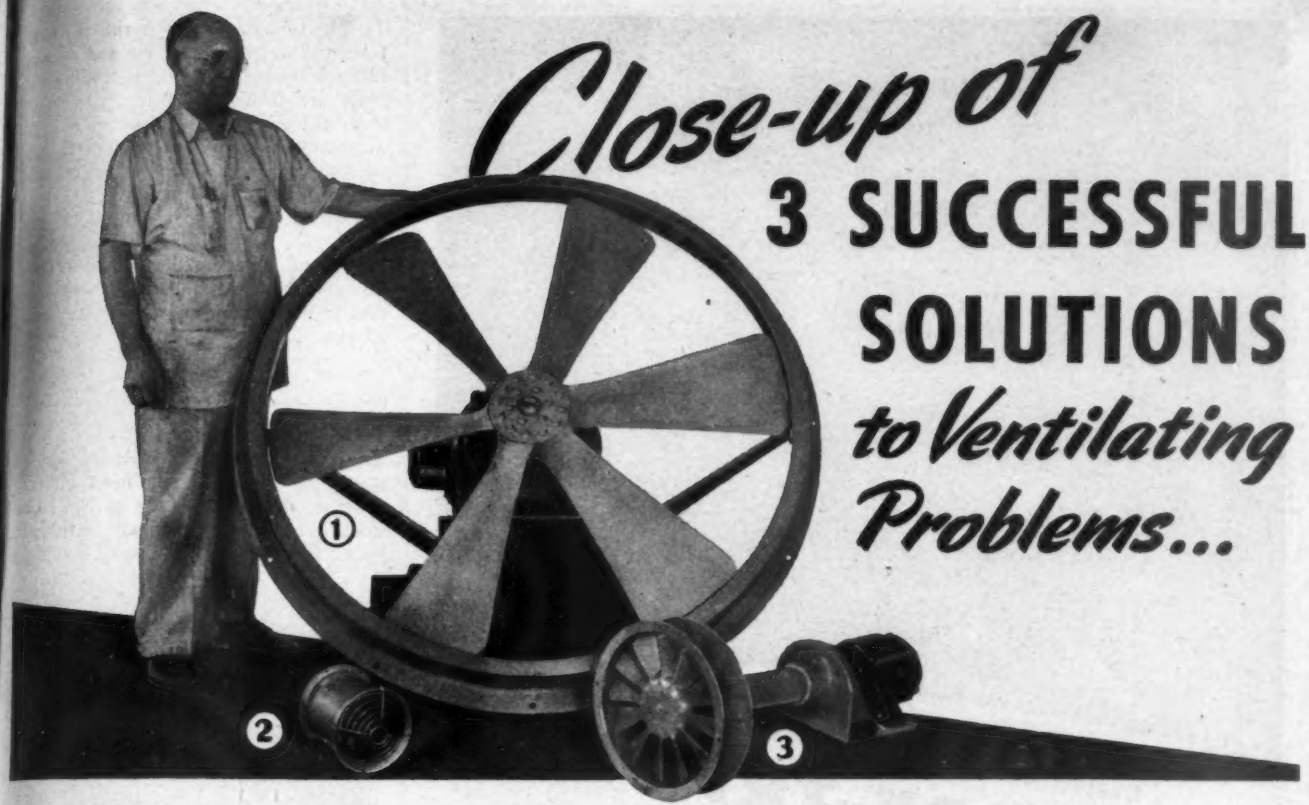
installations are desired. The Masonite reflector is said to direct 85 percent of the light downward for work illumination. Unit can be suspended or mounted close to the ceiling. The Edwin F. Guth Co., 2615 Washington Blvd., St. Louis 3.

Synthetic Rubber Surfacing Material

Known as Industrial So-Lo, material is now being made with synthetic rubber, which is claimed to give it superior advantages. It is said to be particularly useful for repairing breaks and burnt or worn spots, filling holes, and resurfacing industrial belts of all types. The product consists of a cement primer to be applied after roughening the belt surface, and a mastic, spread on to obtain a smooth oil- and grease-resistant surface that dries overnight. Other uses suggested by the maker are resurfacing metal, wood, and composition pulleys, insulating switch handles and other electrical devices, and repairing rubber boots and gloves. Available in 1-qt., 1-gal., and 5-gal. containers. So-Lo Works, Loveland, Ohio.

Insulation-Resistance Meter

Electronic instrument is announced for measuring resistance of insulation in apparatus during manufacture to reveal imperfections, for checking condition of apparatus in service, and for wide application in laboratory testing. The instrument consists of a conventional electronic rectifier, a



Close-up of 3 SUCCESSFUL SOLUTIONS to Ventilating Problems...

Every ventilating problem has a solution. The trick lies in knowing the most direct route to the correct answers—and that's where Propellair representatives can help you. Shown above are three interesting Propellair units that are definitely solving three types of problems. . . .

AXIAL-FLOW, AIRFOIL PROPELLERS

Propellair-designed to move maximum air with minimum horsepower. Air-flow is even over whole blade, not just the tip. Blades are non-overloading.

EXTRA-VOLUME CURVED ENTRANCE RING

This scientifically curved ring moves more air than straight-edge rings. Permits utilization of airfoil, air-movement principle in ring as well as propeller.

❶ This problem involved the ventilation of a large area. It called for the use of a fan with great capacity, very high efficiency and good pressure characteristics. Propellair installed the big model with six "S" type airfoil blades, driven at 1140 RPM by a 10 HP Uni-Shell motor. The installation moved 44,000 CFM and the problem was solved.

❷ Here the distribution of heat in fighting planes demanded a small, very light-weight unit with capacity to move a large volume of heated air at high altitudes. Propellair developed the model shown, weighing less than six pounds, and using only 1/6 HP. It has proved a complete success, moving 450 CFM at 20,000 ft. altitude. *Modifications of this unit are available for commercial applications.*

❸ A manufacturer had been unable to cope with explosive and corrosive fumes. A heat problem also was present. Propellair installed an extension-shaft unit with twelve axial-flow, airfoil section blades. In this unit, shown above at right, ball bearings in a tubular housing carry the shaft extension and permit the fan to operate in a duct, with motor outside the duct. Since the day of installation there has been no trouble with fumes or excess heat. The same construction is available up to 60″ diameters.

Many other Propellair units are pictured and described in our informative 72-page catalog. Write for your free copy.

If you have a pressing industrial ventilating problem, you should have our Propellair catalog No. 10-W. It contains many pages of technical tables, charts, diagrams and other valuable information for architects, engineers and plant men—and of course describes and illustrates the complete Propellair line. We will mail the catalog on request or, if you prefer, we will ask the nearest Propellair ventilating specialist to deliver your copy personally and at the same time discuss your specific problems. *Write!*

PROPELLAIR
INC.
"Moving Air Is Our Business"
SPRINGFIELD • OHIO

ELIMINATE THE HOME-FRONT
BOOBY-TRAPS
FROM YOUR PLANT

Oil and grease on your floors are booby-traps that make casualties of the soldiers of production, by causing slipping and falling accidents, inviting costly fires, and side-tracking vital manpower into non-productive cleaning labor. Rid your plant of these aids-to-the-Axis quickly, efficiently and economically by using SPEEDI-DRI—a white, granular substance, easily spread by hand, that absorbs *all* oil and grease, sets up an immediate non-skid surface, retards fire, and saves a lot of labor needed elsewhere. Write for free sample or demonstration.

GRUMMAN AIRCRAFT says:

"We use SPEEDI-DRI in practically every plant," writes A. W. Stevens, Maintenance Supervisor of Grumman Aircraft. "Maintenance crews use it to dry up leaks on oil hydraulic breakdowns. It makes their work safer and cleaner."

SPEEDI·DRI
OIL AND GREASE ABSORBENT

UL

SUPPLIERS

East
REFINERS LUBRICATING CO.
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WAVERLY PETROLEUM PRODUCTS CO.
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WAVERLY PETROLEUM PRODUCTS CO.
Russ Building, San Francisco 4, Calif.

Prompt Service from Warehouse Stocks in Leading Cities

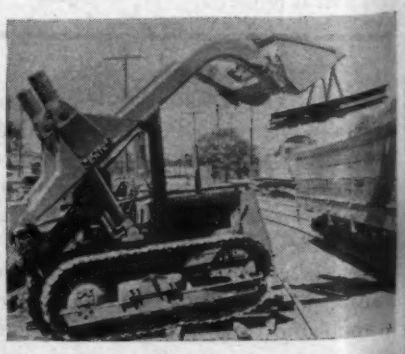
Thyrite bridge circuit, and an electronic-tube voltmeter. It can be used wherever 115-volt, 60-cycle current is available. Two types are furnished, in scale calibrations from 1 to 50 megohms and 0 to 20,000 megohms, the latter using four resistance ranges chosen by a panel-mounted, rotary switch. Resistance is measured at 500 volts d.c. except in the 0 to 5 megohms range, which uses 0-250 volts d.c. Scale is illuminated and direct-reading. The complete instrument is small, light in weight, and said to be economical to operate. General Electric Co., Schenectady.

Industrial Truck

Truck of wooden construction, which is stated to withstand the most punishing abuse is offered. It is built of No. 1 clear-stock kiln-dried oak, 1 inch in thickness, joined together with screw and bolt fastenings, with each corner reinforced with a 2-in. supporting post. Standard unit is 28 inches wide, 42 inches long, 34 inches high, and is equipped with two swivel and two stationary 5-in. heavy-duty casters. Acro Tool & Die Works, 4892 N. Clark St., Chicago 40.

Tractor Unit

Dozershovel is designed to serve both as a tractor shovel and bulldozer by quick interchangeability of bucket and dozer blade. It can also be used as a lifting crane by use of standard hook on upper edge of either accessory. Used as a shovel, the unit's hydraulic control is said to provide down pressure up to 4200 pounds which secures real digging "bites" and big pay loads in a short distance of travel. The same control on the bulldozer is stated to provide easy penetration in hard



for BATTLESHIP or FACTORY

Cone-Drive double-enveloping gearing has now made possible the design of completely self-contained standardized turbine reduction units of high capacity in really compact form. Today these units are serving on the battleships, cruisers, aircraft carriers and destroyers of the U. S. Navy. Tomorrow they will be available for industrial turbine reduction drives.

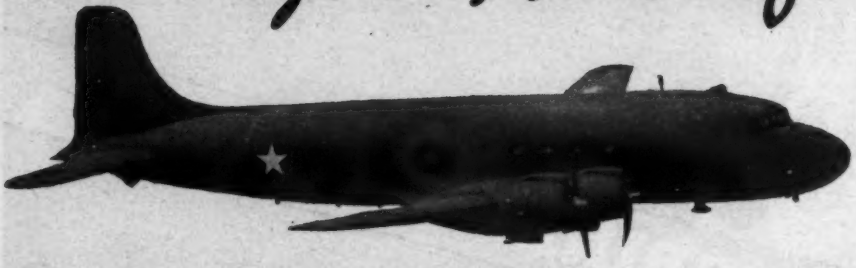
Designed for input speeds of 5,000 to 6,000 rpm, they come in two standard sizes at present—26½ and 37 hp, with gear ratios of 3½ to 1 to 8 to 1. Built in are pressure lubrication system (with pump), oil cooler, oil filter, pressure gage, thermometer and oil pressure relief valve. The larger unit has 6-in. C. D. "Cone-Drives", while the smaller is on 4½ in. center distance.

If you don't know the story of "Cone-Drive" gearing and what it can mean to geared product designs tomorrow, write today for Manual No. CW-41-B (for executives), CW-41-A (for design engineers).

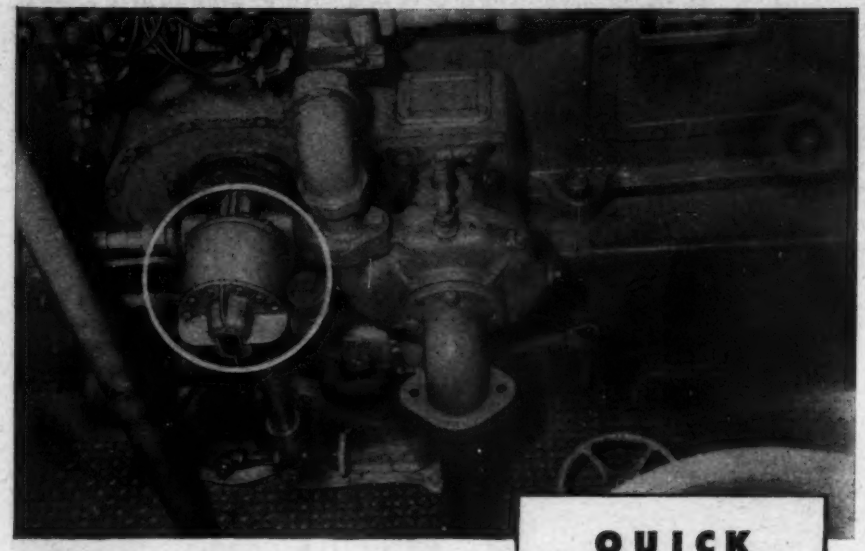
FOR VICTORY BUY UNITED STATES WAR BONDS AND STAMPS

CONE-DRIVE DIVISION MICHIGAN TOOL COMPANY
7171 E. McNichols Rd., Detroit 12, U.S.A.

AT Douglas Aircraft



Roper Rotary Pumps are on the job 24 hours per day!



At the Douglas Aircraft Company's new blackout plant in California, Roper Rotary Pumps are doing their part in stepping up plane production. The Roper equipped air compressor, illustrated above, provides power for hundreds of air tools throughout the plant.

QUICK FACTS

- Roper Pumps are built in capacities of 1, 3, 5, 10, 15, 20, 35, 50, 75, 100, 150, 200, 300, 500, 750 and 1000 gals. per minute.
- Pressure up to 1000 lbs. per square inch.
- Speeds up to 1800 revolutions per minute.
- Mountings and Drives for any practical purpose including direct mounted, gear driven, V-belt, flat belt, chain and hand operation.

Write for Catalog 138

A summary of factual information on pumps and pumping problems.

ARMY E NAVY

GEO. D. ROPER CORP., ROCKFORD, ILL.

ROPER Rotary PUMPS

materials and ability to hold the cut. Other features include unobstructed visibility, low overhead clearance of 8 feet, 1½ inches, oscillating tracks (of T9 or TD9 International Trac Tractor design) for stability on uneven ground, and high lift for fast loading of trucks. Bucyrus-Erie Co., South Milwaukee, Wis.

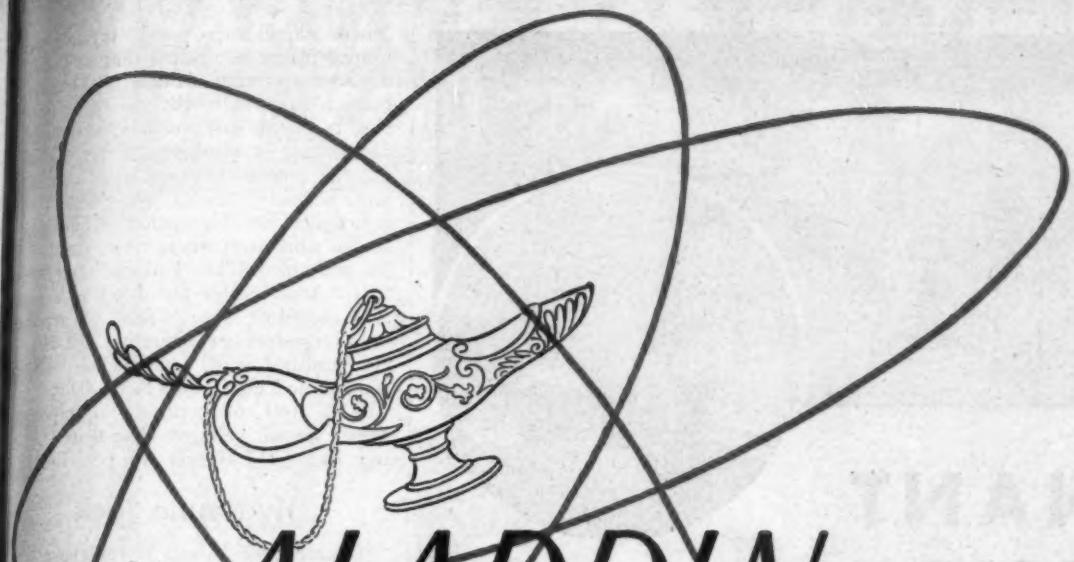
Dry-Type Transformer

Greater safety and ease of installation, as well as attractive outward appearance, are claimed for redesigned line of indoor dry-type transformers for primary circuits of 601 to 15,000 volts. Enclosure is said to be of less weight and to provide improved and directed circulation of cooling air. Horizontally louvered sections on two sides of the case can be removed to make interior accessible for cleaning and tap changing. Taps are brought to a convenient terminal board located just below edge of casing and close to a diagram-

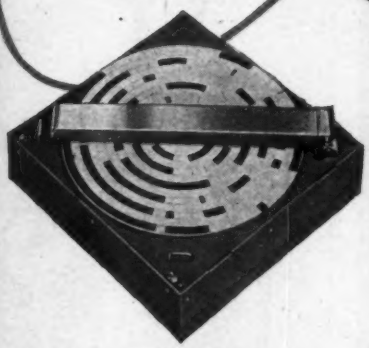
matic nameplate. All live parts are metal-enclosed; various portions of the case are separately removable. Access to both high- and low-voltage terminal compartments is gained by removal of separate covers. Holes are provided for insertion of rods through interior supports for easy handling. Protection from hazards of sprinkler system operation, or from accidental contact of rods or wire being carried by workmen, is afforded by solid sheet-metal top and sides, and deeply pitched louvers. Transformer length is about twice its width to facilitate installation in dead floor space or on platform mounting. General Electric Co., Schenectady.

Fluorescent Fixtures

Line of lighting fixtures, made in one size only, for four 40-watt fluorescent lamps, is announced. Fixtures are stated to be designed within latest WBP steel weight limitation order L-78 to take full advantage of all available material to provide rigidity and strength. Several models are available for specific requirements. The "Parkway" is designed for lighting of administrative and engineering areas, where an inexpensive but efficient open-type fixture is desired. The "Crusader" is for



ALADDIN is not on our payroll >>>



AUTOMATIC PROCESS CONTROL

This new development by the research laboratories of General Electronics Industries provides automatic control of chemical processes and also of production machinery, by means of printed charts which may be replaced or interchanged as readily as phonograph records.

Other products manufactured include:

ELECTRONIC CONTROLS • VACUUM TUBES
HYDRAULIC SERVOS • COMMERCIAL RADIO EQUIPMENT
ELECTROSTATIC HEATING UNITS UP TO 250 KW.
ELECTROMECHANICAL DEVICES

Not abracadabra, but brains and sweat is our formula for the successful application of Electronics to your business.

● Our research engineers scientifically apply known principles to the solution of specific problems. The result may be a production-line miracle—but it isn't magic.

Research skill and experience, backed by the unsurpassed facilities of one of the largest organizations specializing in Electronics, and coupled with expert service at all times, are what we have to offer. Nothing awesome, mind you, but practical, scientific know-how and sound business practice that get results.

If this sane, "feet-on-the-ground" service is the kind of help you want on your postwar production planning, why not write: Engineering Department, General Electronics Industries, 342 West Putnam Avenue, Greenwich, Connecticut.

ARMY-NAVY "E" WITH STAR awarded to Auto-Ordnance Corporation for continued excellence in production of "Tommy" Guns.

GENERAL *Electronics* INDUSTRIES

Division of Auto-Ordnance Corporation

GREENWICH • STAMFORD • BRIDGEPORT • NEW MILFORD • NEW YORK

CONTRIBUTE TO INFANTILE PARALYSIS FUND — JANUARY 14TH TO 31ST

TENNANT PRECISION

—FAMOUS IN FLOOR MAINTENANCE SERVICE

goes to War!

TENNANT Precision Equipment and Engineering Skill—developed in making TENNANT Floor Machines—is proving its exacting accuracy standards in manufacturing gun sights for the U. S. Armed Forces.

Another important TENNANT War Service is in maintaining SAFE, Clean Floors in War factories, mills and offices. Clean floors help to reduce accidents, speed production and facilitate the movement of materials through the plant.

Our field representatives are handicapped somewhat by travel restrictions in making personal calls. However, when you need help, Tennant service is available without cost.

If you have floor cleaning and maintenance problems write or wire us today.

TENNANT-Made GUN SIGHTS
at the Battle Fronts

TENNANT Floor Machines
in War Materiel Plants

G. H. TENNANT CO. ESTABLISHED 1870 — 2554 North 2nd St. Minneapolis, Minn.

TENNANT SYSTEM OF INDUSTRIAL FLOOR MAINTENANCE

general application, and features deformed plastic side panels that are claimed not to warp, creep, or deform. The entire body is snapped to the chassis by spring clips to permit easy and quick dismantling for cleaning or relamping. "Parkway" units can be converted to closed-type "Crusader" units whenever desired. The "4-Star" unit is designed for illumination of offices and similar work areas where close, visual tasks are performed. The "Parkway" and "Crusader" are available for direct or suspension mounting; the "4-Star" is available only for suspension mounting. All fixtures are furnished wired, and include sockets, starters, and high power-factor ballasts for 110-125 volt, 60 cycle a.c. operation or other special voltages. Day-Brite Lighting, Inc., 5411 Bulwer Ave., St. Louis 7.

Hydraulic Jack

Capacities of 30 and 50 tons have been added to the maker's line of Simplex hydraulic jacks to meet a current need for capacities in excess of 20 tons. Jacks are equipped with high- or low-speed pumps, and can be operated singly or in unison. Base is made of special analysis solid steel

bar stock that adds to the load-bearing security. Two release valves, located on opposite sides of base, offer convenience for the operator. Either release screw controls ram return. Weighing 65 and 115 pounds, respectively, both the 30- and 50-ton sizes have a hydraulic lift of 7 inches from respective low heights of 11 and 12 inches. Templeton, Kenly & Co., 1022 S. Central Ave., Chicago.

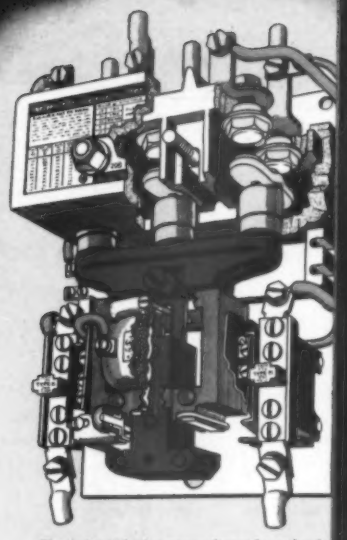
Metals Cleaner

"Running Gear" is an emulsifiable type cleaner designed for quick removal of oils and solid-particle dirts and greases from metals and machinery, especially when they are very hard and caked on. It is claimed not to be harmful to any metals, and can be used at room temperature up to 90 deg. F. It may be applied

WARTIME HAS NO TIME for CONTACT MAINTENANCE

Copper contact before and after 50,000 operation life test. It was necessary to replace contact.

A-B silver alloy contact before and after same test. Contacts were still good for thousands of operations.



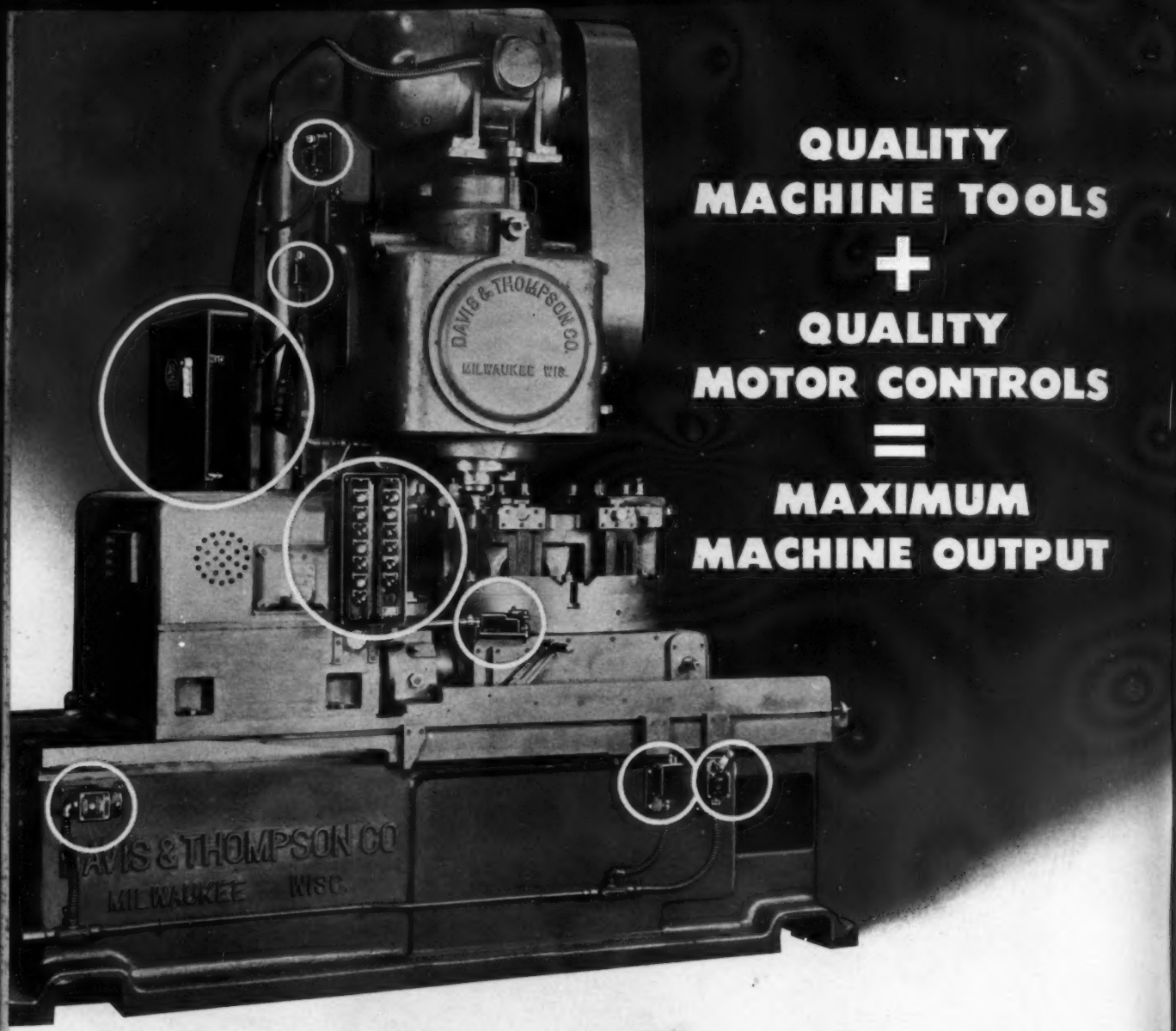
The solenoid plunger—shown in red—is the only moving part of the A-B starter.

War plant machinery needs the freedom from contact maintenance that is part of Allen-Bradley trouble-free motor controls. A-B solenoid starters have patented, double break, silver alloy contacts which are good for millions of operations. They never need cleaning, dressing, or filing. The oxide which may form on them is a good electrical conductor and therefore low contact resistance is always assured. When you're making replacements or buying new motorized equipment, be sure to specify trouble-free Allen-Bradley motor controls. Write today for Bulletin 709.

A-B Quality

ALLEN-BRADLEY
SOLENOID MOTOR STARTERS

QUALITY



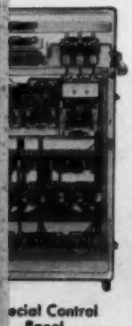
QUALITY MACHINE TOOLS + QUALITY MOTOR CONTROLS = MAXIMUM MACHINE OUTPUT

Relay

Limit Switch and Precision Limit Switch

ross-the-line starter

Push Buttons



ocial Control Panel

Your guarantee of highest efficiency from operator and machine is to use Allen-Bradley controls for automatic sequence operations. Oscillograph tests show that A-B solenoid controls close in short, uniform pick-up intervals which assure consistent switching performance. No other magnetic controls provide such split-cycle accuracy which saves time and increases the production of your machine.

There's no time lost for maintenance either. A-B double break, silver alloy contacts never need filing, cleaning, or dressing. With only one moving part, there's nothing to get out of order. A-B controls are an asset to any machine.

Allen-Bradley Company, 1316 S. Second St.
Milwaukee 4, Wis.

ALLEN-BRADLEY

AUTOMATIC MOTOR CONTROL

by pressure spray as well as by dip method, thereby making it particularly adaptable for cleaning heavy accumulations on large machine parts that are too big or unwieldy for immersion process. In use it is mixed with 3 to 10 times the volume of kerosene or the common mineral spirits, depending upon the severity of the cleaning job on hand. Technical Process Division of Colonial Alloys Co., Colonial Philadelphia Bldg., Philadelphia 34.

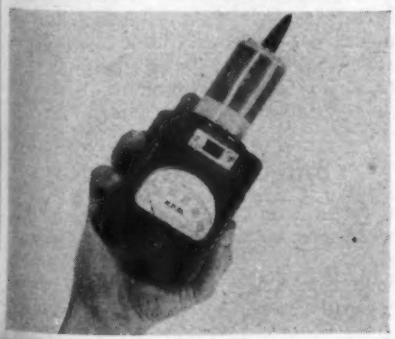
"Non-Skid" Spray Equipment

Spray equipment assembly is announced that is especially designed for application of "non-skid" materials used as substitutes for rubber matting. These materials,

usually made up of a synthetic resin base to which a small amount of fairly fine mesh grit is added, are said to be applied fastest and most efficiently with proper spray equipment. The DeVilbiss Co., Toledo, Ohio.

Electric Tachometer

Self-energized tachometer, which can be used either as a "hand" type or "separable" type, consists of a small generator coupled electrically to an electric meter. Generator contains a small, permanent Alnico magnet rotor, which is mounted on



precision sealed ball bearings and is capable of continuous operation at any speed within limit of the meter. Meter is a rectifier type, capable of withstanding a momentary overload up to four times the maximum speed indication without damage, and provided with Hi and Lo range controlled by switch. Generator and meter units may be mechanically coupled together by bayonet lock to form "hand" type, or the meter unit may be sepa-

the secret of getting

FASTEST DELIVERY

DON'T wait for "routine" afternoon pickups, when shipping AIR EXPRESS. Get your shipments on the way as soon as they are ready—as early in the day as possible.

That's the secret of getting fastest delivery. Because you avoid possible delay, due to end-of-day congestion when Airline traffic is at its peak.

And to cut costs—AIR EXPRESS shipments should be *packed compactly* but securely, to obtain the best ratio of size to weight.

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As a result of increased efficiency developed to meet wartime demands, rates have recently been reduced. Shippers nationwide are now saving an average of more than 10% on Air Express charges. And Air Express schedules are based on "hours", not days and weeks—with 3-mile-a-minute service direct to hundreds of U. S. cities and scores of foreign countries.

WRITE TODAY for "Vision Unlimited"—an informative booklet that will stimulate the thinking of every executive. Dept. PR-1, Railway Express Agency, 230 Park Avenue, New York 17, N. Y.

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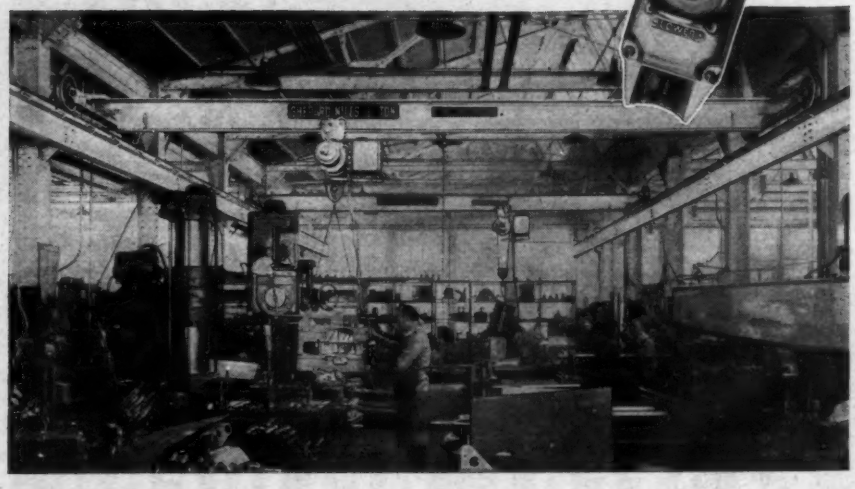
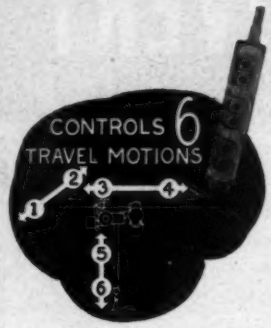




1.—Each of three switches assembled in a strong, light, dust-tight case, consists of two buttons, assembled as a unit. One switch controls the travel of the crane along the runway; another controls the movement of the hoist along the single beam of the crane, while the third switch regulates the up and down movement of the hook.

2.—Each button, as it is pressed inward, makes 5 electrical contacts, corresponding to 5 independent speeds in each direction of rotation.

3.—Emergency stop switch located at lower end of assembly opens all circuits.

means fast, accurate load handling

Shepard Niles Electric Cranes & Hoists go to work on the toughest handling jobs by simply pushing a button. Loads are lifted, conveyed, deposited—swiftly and safely—rehandling is eliminated—operating costs materially cut.

With dependability and accuracy, Shepard Niles selective, 5-speed, push-button control is master of every crane or hoist movement, whether accelerating or decelerating.

Shepard Niles Single Beam Cranes are available in "Push-type", "Hand-racked" and "Motor-driven" types of crane propulsion, in Over-running, Inner-running or Under-running construction. Capacities from ¼ ton to 10 tons.

MAINTENANCE MANUAL—FREE ON REQUEST.
Describes maintenance of Shepard Niles Cranes & Hoists—amply illustrated with line and sectional drawings. 106 pages.

Shepard Niles

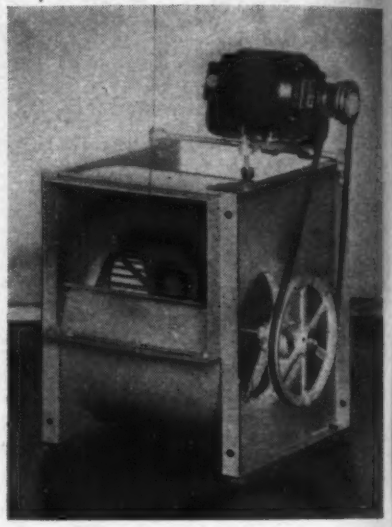
CRANE & HOIST CORPORATION

364 SCHUYLER AVE • MONTOUR FALLS, N. Y.

rated for permanent mounting and connected to generator unit by a two-conductor electric cord up to several hundred feet in length, without introducing appreciable error in scale reading. Complete unit weighs 3 pounds, is 3x7½x2½ inches overall, and comes with standard 5-ft. cord, in speed ranges up to 2500 and 5000 r.p.m. Ideal Commutator Dresser Co., Sycamore, Illinois.

Blower

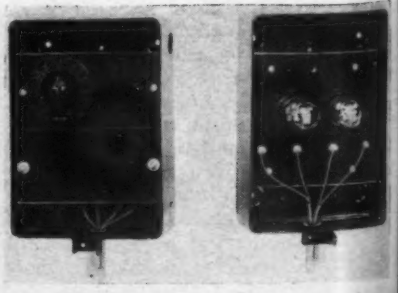
Line of Quad 4-way interchangeable blowers has been redesigned so that blower housing acts as the frame. This is accomplished by the welding of a heavy scroll sheet between two end-plates, thus forming a beam inside of which the balanced blower wheel is installed. Blower may be driven from right or left, and option of mounting motor at top, rear, or front



of blower frame permits outlet interchangeability to fit varying conditions. The bearing oiler can also be easily moved so that oiling cup is always upright and accessible. Streamlined inlet is die-stamped on each side of blower to obtain quiet, efficient operation. Wheel diameter sizes range from 6 to 25 inches, and all models are provided with cushioned feet attachable to any one of the four positions. Trade-Wind Motorfans, Inc., 5725 South Main St., Los Angeles.

Bin Level Indicator

Level indicator, for dry materials bin, which operates entirely on electronic principle, is available. It is stated to be wholly foolproof because of absence of any moving parts, and to be effective in measuring



DBL High Speed Steel HAS SET RECORDS . . . NOW HERE'S *Super DBL!*

DEVELOPED ESPECIALLY FOR YOUR HEAVY-CUT FAST-FEED, HARD AND *Tough Jobs!*

THIS is the next step in Allegheny Ludlum metallurgical development of the DBL low-tungsten molybdenum analysis. *Super DBL* is the DBL analysis with the addition of cobalt, and it develops the maximum red hardness—the same *extra margin* of cutting quality—that you were formerly accustomed to get in a tungsten cobalt steel as compared to 18-4-1.

Super DBL has been thoroughly tested and proved. In performance, as well as in the conservation of vital alloys, it meets the needs of the times. You'll find it an ideal selection for heavy duty tools—especially suited for roughing or hogging work on hard, gritty materials, such as cast iron and steel; or on tough materials like heat treated alloy and stainless steels. There is nothing special in its heat treating or handling requirements. ● Available *now*—in standard forms and finishes, and in mill-treated toolholder bits—from Allegheny Ludlum and distributor's warehouse stocks, coast to coast.

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BRACKENRIDGE, PENNSYLVANIA

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CLEANLINESS
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ELIMINATE
DUST AND DIRT!
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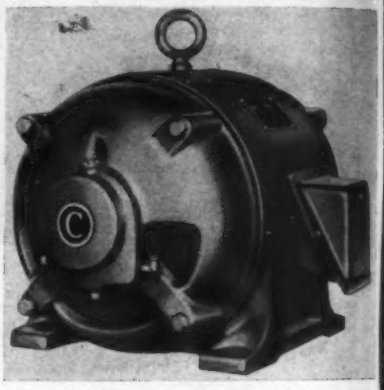
DUST ARRESTORS
In hundreds of cases factory dust and dirt is the primary cause of absenteeism, slowing up of production plus premature deterioration of equipment and plant. Parsons Oval Bag Dust Arrestor affording proper and efficient dust control is the one sure, inexpensive way of eliminating this menace.
Parsons Oval Bag Dust Arrestors have been doing an outstanding job in all types of industries, for over a quarter of a century and today are recognized as one of the most modern and efficient pieces of dust control equipment on the market. Equipped with many exclusive features such as patented Oval Filtering Bags, Non-rusting Arrestor Case, simple Texrope Drive, Heavy Duty Welded Hoppers and others.
Regardless of what your problem is, call in our engineers, no obligation, or write for our free dust control bulletin, "Mastery of The Air."
PARSONS Engineering CORP.
2545 E. 79th STREET • CLEVELAND, OHIO

all types of materials, whether fine or coarse. Unit consists of a detector box attached to a probe extending into the bin, and a signal control box attached to a colored light that shows when bin level has reached the probe location, usually either at full or empty. Specific intermediate levels may be similarly determined by the addition of a detector box and probe at each of the required positions. Signal control may be extended through appropriate relays to include valve cutoff, sound maker, or other remote signal device. The system is said to be inexpensive and easy to install. Illustration shows control and detector boxes with covers off. Mosher Electronic Control Systems, 130 West 42nd St., New York 18.

Electric Motor

Century, Form J, general-purpose open-rated motors are now available in protected design. Upper half of end bracket is closed to minimize possibility of dripping liquids or falling solids entering vital parts of motor. Two powerful fans located be-



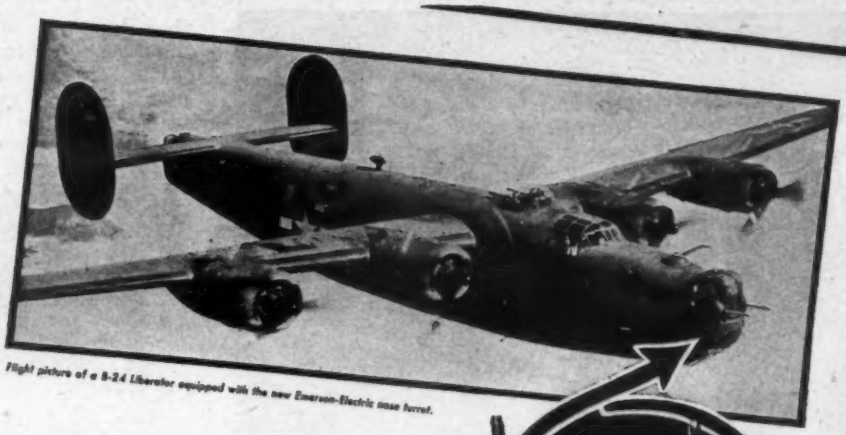
hind bearing brackets draw cooling air through the bearing bracket openings, around the bearings, across the windings, and to air passages between outer surfaces of magnetic core and the frame. Heated air is expelled through openings at side and bottom of frame. Century Electric Co., 1806 Pine St., St. Louis 3.

Welding Cover Glass

To secure substantial reduction in time wasted in replacing broken or easily pitted cover glasses of welding masks, maker is offering "Balite" processed cover glasses. They consist of regular glass processed with a protective coating that is intended to shield glass against heat breakage and damage from metal splatter. Coating is obtainable either in clear grade or blue tint for checking harmful rays and glare. Hopkins Engineering Co., 230 N. Michigan Ave., Chicago 1.

Electronic Controller

Pneumatic indicating controller, known as Celectray, is an electronic instrument that claims improvement over former models because it does not employ a motor or other continuously moving parts. On-and-off or open-and-shut control is available in two models—high sensitivity non-adjust-



Flight picture of a B-24 Liberator equipped with the new Emerson-Electric nose turret.

Emerson-Electric Builds *New Fighting Power* For the Air Offensive ---

Close-up view of the new nose turret, equipped with two .50 cal. guns.

Now it can be told—the interesting story of the development of the new nose turret designed and manufactured by Emerson-Electric for B-24 Liberators!

It began when Emerson-Electric was given the assignment of building a turret having maximum fire power with proper visibility, safety and comfort for the gunner.

The model B-24 nose turret designed by Emerson-Electric engineers, having these characteristics, passed a series of critical Army tests and was released for production immediately.

In addition to this powerful new weapon, Emerson-Electric has been producing in large quantities, upper-deck and lower ball power-operated airplane gun turrets used on the B-17 Flying Fortress, top turrets for Navy Avenger Bombers, and also top turrets for Army medium two-motor bombers.

Emerson-Electric is continuing to pioneer in the development of new and more effective armament for the air offensive—for quicker Victory through air power.

EMERSON-ELECTRIC AIRCRAFT MOTORS are made for gun turret drives, hydraulic units, fuel pumps, actuators, winterizing units, communication systems—also with built-in gear and magnetic brake.

THE EMERSON ELECTRIC MANUFACTURING CO.
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Emerson-Electric is now engaged 100% in producing equipment for the armed forces of the United States.

EMERSON ELECTRIC

MOTORS • FANS • APPLIANCES

A current Emerson-Electric advertisement in magazines of national circulation.

Bad News for Japs and Nazis...

... but good news for all who know the dependability of Emerson-Electric peacetime products. The precision manufacturing skill which, for 53 years, has characterized Emerson-Electric fans, motors and appliances, is now engaged 100% in vital war work —helping to speed the day of Victory.

Designing and producing a powerful new revolving nose gun turret for the B-24 Liberator Bomber is but one of the achievements for which Emerson-Electric was awarded the Army-Navy "E" and which recently earned a white star for the burgee.

THE EMERSON ELECTRIC MANUFACTURING CO.
SAINT LOUIS

Branches: New York • Chicago • Detroit • Davenport
Los Angeles

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EMERSON ELECTRIC

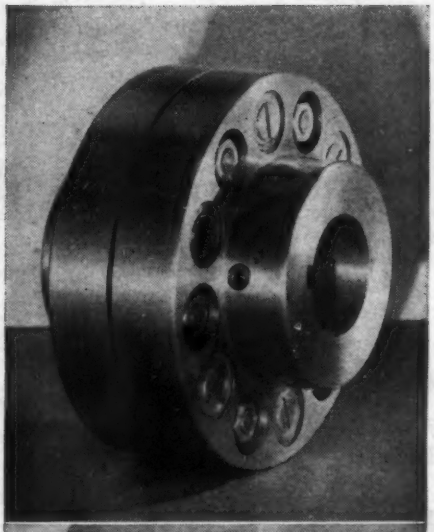
MOTORS • FANS • APPLIANCES

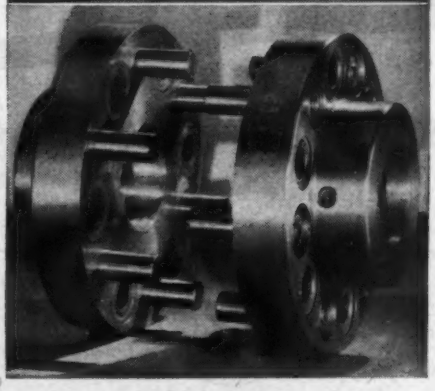
We Dare You....

Just take a couple of pencils right now and try to hold them in perfect alignment without touching each other while you count 10.

Remember that you are making this 10 second test with pencils weighing a fraction of an ounce. At the same time, remember that all the horsepower goes through the coupling connecting heavy machines running at high speed hour after hour.

Ajax Flexible Couplings have been doing this job for over 20 years. They do it without lubrication because of their rubber bushed, graphited - bronze bearings and interlocking drive studs. Write for the facts on Ajax Flexible Couplings.





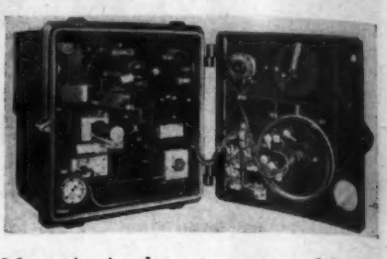
AJAX

ARMY E NAVY

FLEXIBLE COUPLING CO.

Incorporated 1920 **WESTFIELD, N.Y.**

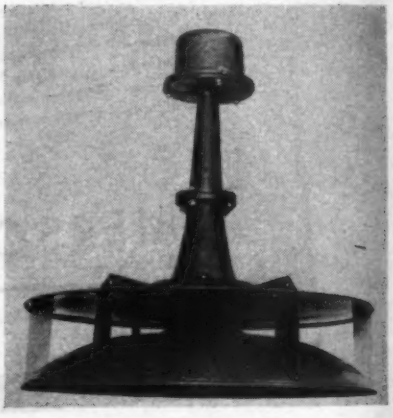
able throttling, and on-and-off without throttling. Other features include no measurable "dead zone," no mechanical connection between galvanometer and pneumatic circuit, no "flapper," and simple load-error adjustment with manual reset.



Magnetic air-valve acts as an amplifier and converter from electric to pneumatic operation. Maker claims this instrument is least affected by process lag, is stable at smaller throttling zones, is not affected by long leads, is vibration proof, and simple in operation and adjustment. C. J. Tagliabue Mfg. Co., 550 Park Ave., Brooklyn 5, N.Y.

Sound Distributor

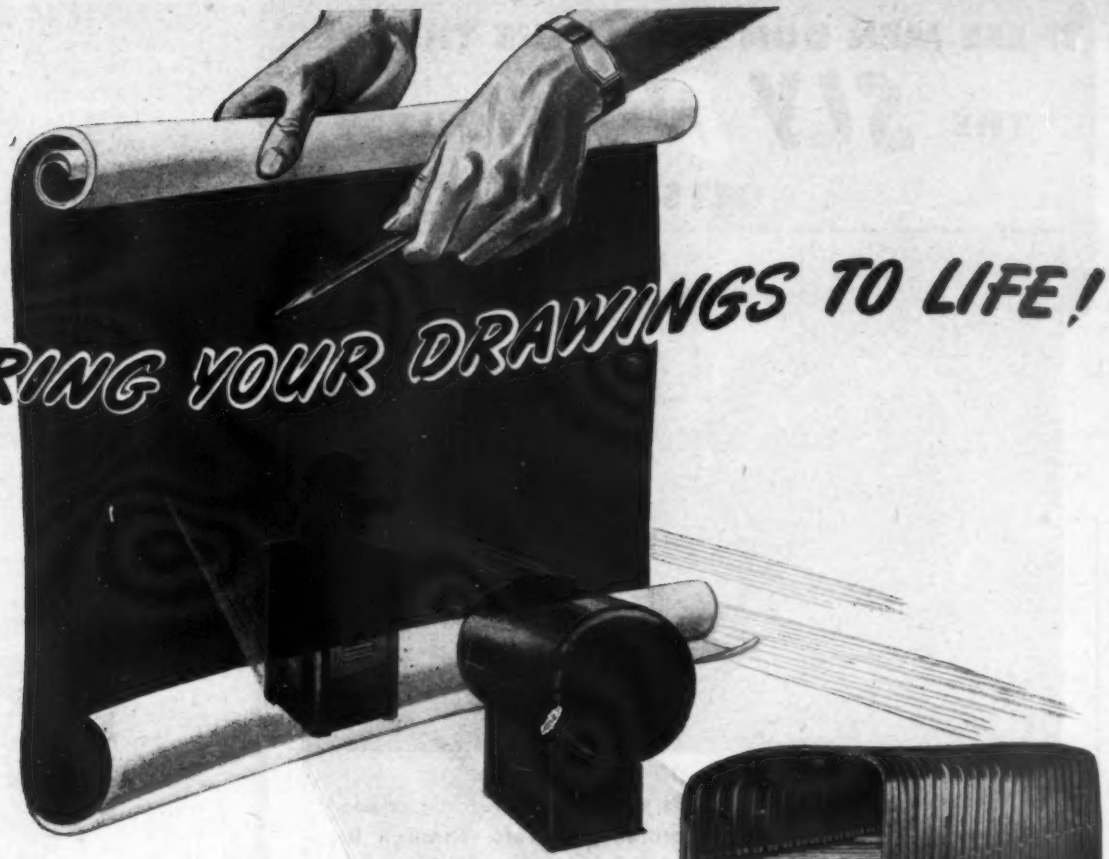
Type L-360 annular sound distributor is said to obtain uniformity of sound distribution both as to frequency and power over a horizontal plane of 360 degrees and a vertical plane of approximately 40 degrees. Maker claims utilization of prin-



ciple of sound distribution that combines molecular reflection and collision instead of collision alone. The speaker is 23 inches in diameter with an overall height of 25 inches, and is stated to be able to handle power input of 20 watts when equipped with Jensen U-20 drive unit. The Langevin Co., 37 West 65th St., New York 23.

Skin Protection

Cadet Creme is offered for industrial uses where skin protection is desired against a wide range of non-water-containing irritants and pore-filling substances that otherwise necessitate the use of solvents or alkalis for their removal. It is stated to contain no irritant chemicals and not to retard normal perspiration. Protection of skin is claimed against welding flashes and photo-sensitizing actions of certain heavy petroleum distillates. Removal is said to be easily and quickly accomplished by use of water. A waterproof preparation that



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Made to Meet EXACT Specifications

For over a third of a century, fabrication of sheet metals has been an important part of the Kirk & Blum business. Throughout all these years, we have been guided by one fixed ideal: To interpret the customer's blue prints accurately, and produce finished work that exactly meets specifications.

We specialize in parts and assemblies of sheet steel (3/8" plate or lighter), stainless (all types), monel and other alloy sheet or plate. Modern expanded facilities, plus highly skilled workmen trained in the use of specially built equipment, enable us to produce accurately-made sheet metal parts faster and more economically. We are completely equipped for cutting, shearing, forming bending, rolling, welding, and assembling completed products and assemblies.

It just doesn't pay to take chances with sheet metal fabrication. Play safe...avail yourself of Kirk & Blum facilities which assure fabricated sheet metal products made the way you want them, when you want them—at low cost.

Send your blue prints, for prompt quotation to THE KIRK & BLUM MFG. CO., 2835 Spring Grove Ave., Cincinnati, Ohio.

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WRITE FOR BOOKLET, "DATA ON KIRK & BLUM PRODUCTION FACILITIES"

THESE MEN DON'T BREATHE THE DUST

THE SLY DUST FILTER GETS IT

INTO these dust intake hoods disappears the dust created in manufacturing special grinding wheels. Through the flexible exhaust pipes, the dust-laden air is pulled into the Sly Dust Filter.

●

Below is the Sly Dust Filter, with fan house, where the dust is filtered from the air by means of a unique cloth bag system offering many exclusive advantages. This is but one of over 5000 installations in operation today. Sly Dust Filters are suppressing and collecting 111 kinds of dust in 57 industries.

What is your dust problem? Ask for Bulletin 98.

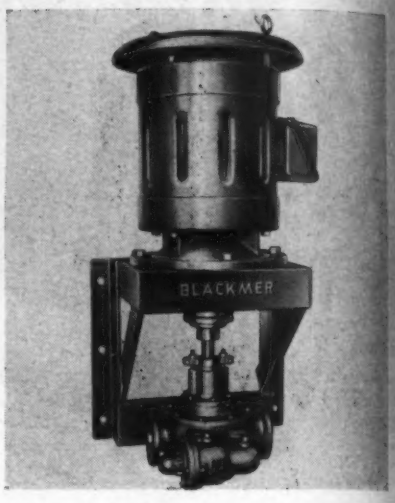
THE W. W. SLY MFG. CO.

4755 Train Avenue · Since 1874 · Cleveland 2, Ohio

is dispersed by hot water is also available for use against dry or aqueous irritants. Cadet Creme Co., 10 Clarence St., Worcester 5, Mass.

Rotary Pump

Marine type rotary pumping unit, with built-in relief valve, is said to have many applications in industrial and processing plants because of type of mounting. To conserve space, the motor is supported by a bracket shelf of welded steel plate that is bolted to bulkhead or wall. The pump is mounted vertically at the foot



of bracket below motor and direct-connected to it by flexible coupling. This arrangement permits free access for lubrication and adjustments. Pump bearings are internal antifriction type, and a split gland is used for ease in repacking. Employing a 3-hp. motor at 870 r.p.m., unit has capacity of 50 g.p.m. at a discharge pressure of 20 lb. per sq. in. Blackmer Pump Co., 1901 Century Ave., S.W., Grand Rapids 9, Mich.

Portable Generator

Air-cooled Epcon B-30 generator, designed to meet wartime needs for portable power and light, delivers 3000 watts, 110-volt a.c., 60 cycle. Net weight is only 305 pounds, length, including base, 34 inches, and height, 26 inches. The motor field ring is high-grade annealed cast steel that is claimed to produce top electrical efficiency for given weight and to give maximum support and stability to generator. Generator is powered by Briggs & Stratton engine through V-belt drive. End

LO-HED HOIST

. . . speeds up and simplifies operation of 2-ton gantry

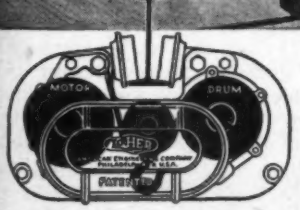
This two-legged gantry crane is entirely independent of the building for support.

A standard 2-ton Lo-Hed Hoist (plain trolley) glove-fitted into the design of the crane because a standard I-beam could be used for a rail, because "balanced construction" of the Lo-Hed permitted the hook to be drawn up to within an inch of the I-beam. That meant low headroom, a desirable plus feature, at no extra cost. Selection of a standard Lo-Hed Hoist facilitated quicker delivery.

In any hoisting job, including applications such as this, look into the possibilities of a Lo-Hed *first*. Write or telegraph for full information on Lo-Hed Hoists.

LO-HED IS THE "BALANCED" HOIST FOR HEAVY DUTY SERVICE

Other important features of the Lo-Hed Hoist are the heavy duty hoist motor; strong, short shafts; heavy duty bearings; 100% positive automatic stop; straight line spur gear drive; and removable protective covers for all vital parts.



The Lo-Hed Hoist can be adapted for operation on any monorail system. There's a Balanced Lo-Hed Electric Hoist for Every Purpose.

Other A-E-CO Products:
TAYLOR STOKERS
MARINE DECK AUXILIARIES
HELE-SHAW FLUID POWER

AE CO 75th ANNIVERSARY

AMERICAN ENGINEERING COMPANY

2426 ARAMINGO AVENUE
PHILADELPHIA, PENNA.

Official OWI Photo

First Choice

STANLEY SCREW DRIVERS

An aircraft maintenance worker reaches for a screw driver more often than for any other hand tool. So he wants the *right* design and *extra* endurance in the driver he uses. That's why Stanley Screw Drivers are the first choice in so many shops where busy crews work night and day to "keep 'em flying".

Stanley makes every type of Screw Driver you need—regular, parallel-sided, or Phillips tips—hardwood or composition handles. Bars and tips are forged from alloy steels to withstand rough treatment. Tips for slotted screws are accurately machine cross-ground to size. Get complete details from your local distributor.

17 Complete Lines of Tools

are described in this handy reference book of fine hand tools. Especially prepared for tool buyers... 56 pages, fully illustrated . . . outside indexed for convenience. Keep a copy on hand.

STANLEY
TRADE MARK

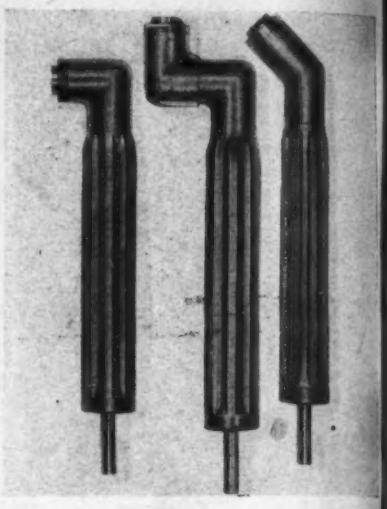
STANLEY TOOLS

DIVISION OF THE STANLEY WORKS
184 ELM STREET, NEW BRITAIN, CONN.
THE TOOL BOX OF THE WORLD

bells are of open design, and dust covers are of lightweight steel spinnings. Cast-iron fittings secure both generator and engine to oak sled runners that provide a strong but light base. Electrical Products Consolidated, 1000 Virginia St., Seattle, Wash.

Angle Drills

Designed to meet demands for still greater precision under severe operating conditions, heavy-duty angle drills are announced for close-quarter work. Ball-bearing radial thrust spindle mount permits drill to be operated at capacity load without excessive heating. Longitudinal ribs of die-cast housing are



designed not only for greater strength but also to provide an easier, surer grip. Standard spindle thread is 1/4-28 thread size; spindle offset is 23/64 inch, and center offset on swivel drill is 1 inch. All parts are precision made and interchangeable. Models shown are 90-deg., 360-deg. swivel and 45-deg. angles. Zephyr Mfg. Co., Inglewood, Cal.

Glass-Drilling Aid

For use in glass drilling where accurate, careful, and rapid results are required, product named Sinszine is offered. Various useful properties are claimed by maker: (1) Product assures rapid, smooth cutting; (2) lubricates and gives greater life to the tool; (3) acts as a cooling agent; (4) prevents smears or a greasy deposit; (5) can be easily and quickly wiped off with cloth, leaving a brilliant luster. Product is available in 4-oz. containers with applicator, also pints, quarts, and gallons. E. Karelsen, Inc., 125 West 45th St., New York 19.

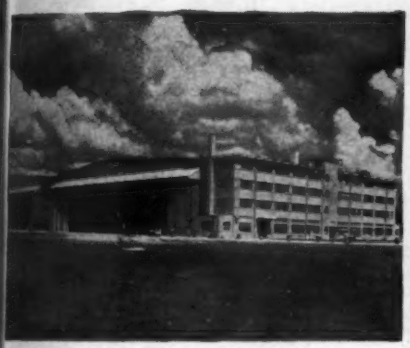
Welding Alloy

Known as Castolin Eutectic No. 1900, alloy rod is intended for various repair uses on magnesium alloy castings. It is recommended by maker for filling and adding metal on castings and parts that are broken, cracked, porous, or otherwise defective, for correcting machining errors, and for filling blowholes or defects. The welds are said to match the parent metal closely in composition and to demonstrate comparable tensile strength, me-

Pan Am Clippers

take the air THROUGH THEIR WINGS!

HOW would *you* like working inside the wing of a plane where air seems to be rationed by the cubic inch? Ever fit an ornery part there while the sweat runs into your eyes and off the end of your nose? If you haven't — try it sometime — you'll understand why 100% efficiency is utterly impossible under such conditions.



Coppus Ventilator furnishing fresh air to wing compartment

This problem has been solved by Pan American World Airways at its new million-dollar Miami hangar, one of the largest in the world. Here Coppus Ventilators supply fresh air to employees working in confined compartments, fuselages and wings. These same Coppus Ventilators are used for field service, too.

Pan American is one of many leading airlines using portable Coppus Blowers and Exhausters to step up production wherever bad air or heat threatens health and efficiency. And Coppus Blowers are used even to inflate barrage balloons for testing seams.

At low cost, you, too, can bring to workers a continued supply of invigorating cool air. The "Blue Ribbon" (a blue band) is your assurance of quality performance at lowest cost. Send for specific information on Coppus Blowers and Exhausters for cable manholes, tanks, shipholds and general man-cooling. Use the coupon.

MAIL COUPON To Coppus Engineering Corp., 451 Park Ave., Worcester 2, Mass.

PLEASE SEND ME INFORMATION ON SUPPLYING FRESH AIR TO MEN WORKING:

A COPPUS
"BLUE RIBBON" PRODUCT

DESIGNED FOR YOUR INDUSTRY
...ENGINEERED FOR YOU

- ☐ in aeroplane fuselages, wings, etc.
- ☐ in tanks, tank cars, drums, etc.
- ☐ in underground cable manholes.
- ☐ on boiler repair jobs.

Other Applications:

- ☐ general man-cooling.
- ☐ cooling motors, generators, switchboards.
- ☐ exhausting welding fumes.
- ☐ freshening air where men are working or material is drying.

NAME.....

COMPANY.....

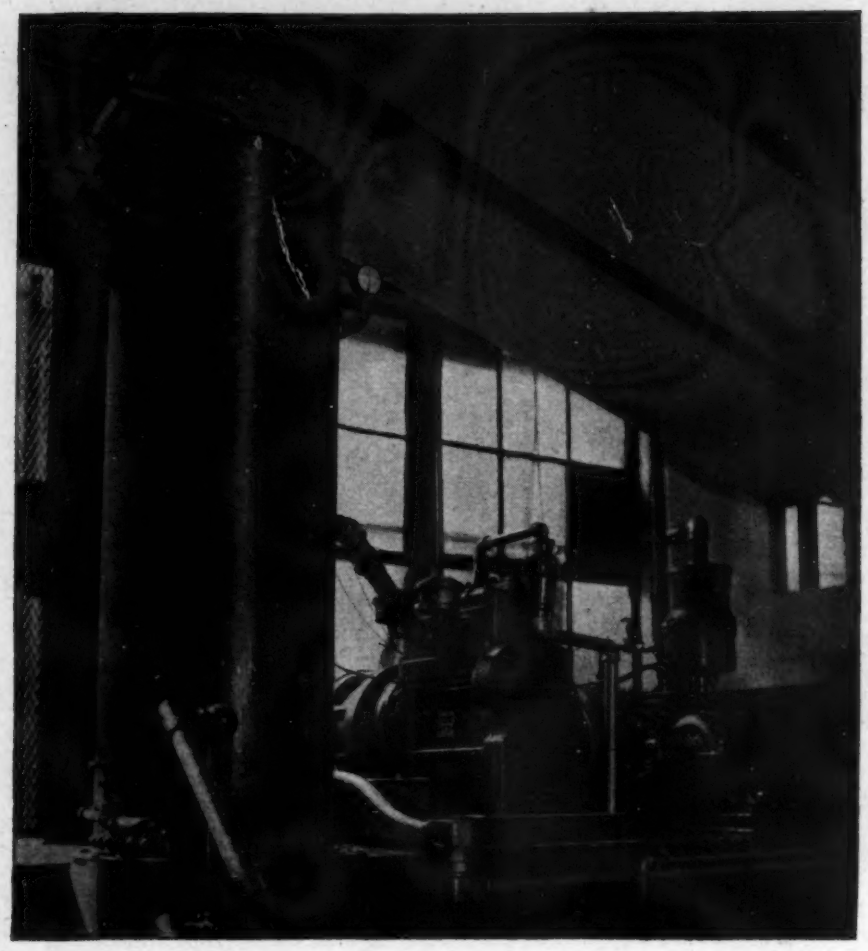
ADDRESS.....

CITY.....

Write here any special ventilating problem you may have.....

.....

SCHRAMM COMPRESSORS ARE *BALANCED* TO ELIMINATE VIBRATION



HERE'S an installation showing just what can be done with an "easy-to-install," compact Schramm air compressor.

The unit represents a "utility" compressor directly driven from 20 HP Electric motor . . . installed on an ordinary wooden platform, which was made possible because of smooth, vibration-free operation.

Schramm compressors are available with various types belt drives, as well as built-in motor drive and direct connected diesel or gasoline engines. Other features that assure you plenty of air include: (1)—completely watercooled (2)—forced feed lubrication (3)—easy to start (4)—mechanical intake valve (5)—sturdy support for cylinder heads.

Specify Schramm Air Compressors in your plant and get heavy-duty continuous operation with least attention, upkeep and operating costs.

Write for full data in Catalog 42-S.

SCHRAMM INC. THE COMPRESSOR PEOPLE WEST CHESTER PENNSYLVANIA

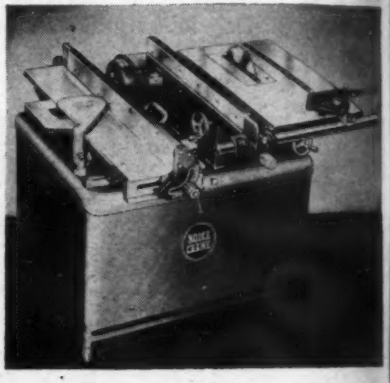
chanical value, hardness, and corrosion resistance. The binding temperature of 960 to 1060 degrees F., being slightly below melting point, is stated to simplify the welding procedure. Eutectic Welding Alloys Co., 40 Worth St., New York.

Slide Rules

Three slide rules are offered for use of professional draftsman, apprentice draftsman or student, and in a 5-in. pocket size. All rules contain the scales A, B, C, D, CI, K, S, L, and T. With the exception of apprentice rule, they are celluloid faced. Apprentice rule has a painted face. Rules are said to be well constructed and accurate, and come equipped with case and instruction sheet. Frederick Post Co., Box 803, Chicago 90.

Saw Jointer

Manufacturer announces combination mounting of previously separate units on one steel floor stand, driven by one motor,



with no interference. Consists of 10-in. tilting-arbor saw, and long-tabled 6-in. jointer that has patented front and rear fence locks. Designed for use where space is limited. Boice-Crane Co., Toledo, Ohio.

Heat Protecting Glove

All-leather industrial glove has been developed as substitute, because of asbestos cloth shortage, that is claimed to give adequate ventilation and coolness for the operator. It is made of heat-resistant leather, in one-fingered mitt pattern, with wool lining. It can be quickly put on or off for safety in the handling of extra hot materials. Thumb and wrist are reinforced by extra layer, and glove is furnished with choice of 4- or 6-in. gauntlet or 2-in. band. Industrial Gloves Co., Danville, Ill.

Drum Opener

Designed for light and middle-weight drums, drum opener operates on the can-opener principle, with smooth cuts folding close to the side. When head is entirely cut through it is removed by grasping with the beaks of the tool. Made of steel drop forgings, hardened and tempered. Industrial Products Co., 2820 N. Fourth St., Philadelphia.

More POWER For Your Man Power
The right tool for every job means more power for your man power . . . plus greater speed and better workmanship! With the increasingly critical labor shortage there is now no place for obsolete tools, "slow" tools, or tools poorly adapted to the job. Fast, flexible and accurate, modern Snap-on tools are giving added efficiency to man power in countless maintenance, production and assembly operations. Snap-on tools are distributed through 35 factory branches located in key production centers. Write for catalog and address of the nearest branch.
SNAP-ON TOOLS CORPORATION
8044-A 28th Avenue
Kenosha, Wisconsin
Snap-on Tools
THE CHOICE OF BETTER MECHANICS

NESBITT SYNCRETIZER
UNIT VENTILATOR
USED PRINCIPALLY IN SCHOOLROOMS FOR THE CONTINUOUS INTRODUCTION AND TEMPERING OF OUTDOOR AIR
The Dual Control Unit that prevents overheating by maintaining a uniform room temperature and prevents cold drafts by maintaining a minimum air-stream temperature.
Publication 231-1
SOLD BY JOHN J. NESBITT, INC., AND AMERICAN BLOWER CORPORATION
NESBITT SURFACES
FOR USE IN HEATING, VENTILATING, AIR-CONDITIONING AND PROCESSING
SERIES H HEATING SURFACE
For high and low steam pressures—Publication 241
DUAL STEAM-DISTRIBUTING TUBE SURFACE
For control by modulating valves—Publication 240
COOLING SURFACE
Series W Water Type Surface—Publication 233
SOLD BY LEADING MANUFACTURERS OF FAN-SYSTEM APPARATUS
See List Below
Webster Nesbitt
UNIT HEATERS
PROPELLER-FAN UNIT HEATERS
For economical heating, small to medium-size interiors.
Publication WN-123
"LITTLE GIANT" DOWN BLOW UNIT HEATERS
For heating medium to large structures, high ceilings.
Publication WN-118
"GIANT" BLOWER TYPE UNIT HEATERS
For heating large interiors. Floor and Suspended models available with or without Thermadjust (by-pass) control.
Publication WN-116
SOLD EXCLUSIVELY BY WARREN WEBSTER & COMPANY
DISTRIBUTORS OF NESBITT-BUILT EQUIPMENT
NESBITT UNIT VENTILATORS
Sold by 8 offices of John J. Nesbitt, Inc., and 33 offices of American Blower Corporation
Webster Nesbitt
UNIT HEATERS
Sold exclusively by 55 offices of Warren Webster & Company
NESBITT SURFACES
Sold by 247 offices of the following leading manufacturers of fan-system apparatus:
American Blower Corporation
Autovent Fan and Blower Division, The Herman Nelson Corporation
Buffalo Forge Company
Clarage Fan Company
Ilg Electric Ventilating Co.
New York Blower Company
The B. F. Sturtevant Co.
CONSULT YOUR TELEPHONE BOOK FOR NEAREST OFFICE
NES

TOMORROW is ~~well on its way~~! IS HERE!

TO men of perception tomorrow is HERE. They know, with the poet Coleridge, that "Often do the spirits of great events stride on before the events, and in today already walks tomorrow."

Men of action are not "waiting for the sunrise." Their postwar plans are more than dreams. If a new schoolhouse is to be built they have the drafting and engineering under way. If a new industrial building is to be erected—or a present structure converted or remodeled—they know their minds and have their roll of blueprints.

In the important matter of the heating and ventilating or air-conditioning equipment many of these men have already cast their die—and it reads NESBITT, a name for yesterday, today and tomorrow.

Nesbitt Unit Ventilators, Nesbitt Surfaces, and Webster-Nesbitt Unit Heaters are distributed in three distinct ways through a total of 310 offices of distributors in the United States. In each of these offices are technical men who will be glad to help *you* take Time by the forelock.

JOHN J. NESBITT, INC., HOLMESBURG, PHILADELPHIA 36, PA.

At Your Service
OVER 300 OFFICES
of Distributors

NESBITT
Heating, Ventilating and Air Conditioning EQUIPMENT

The machine that discovered 100 people

NEED help? So did this Chicago manufacturer. He put in Addressograph *simplified business methods* —with revolutionary results! He found he could transfer 100 men and women to more vital jobs in office and shop —jobs they liked better and where they were worth more.

He found—as thousands of others are finding—that Addressograph can bring to paperwork the same savings of time and money, the same increase in efficiency, as mass production brought to factories. It is a new science, with unlimited opportunities of savings for every American business.

Addressograph machines write payrolls and dividends, personnel records and job tickets, tool crib records and shipping lists—in fact anything that requires accuracy, speed and low cost in repeated writing.

Addressograph (with Multigraph, made by the same company) can save you time and money in 80% of the paperwork you do. You have the machines; let us show you how they can make more money for you now and for all the years to come. Write or call Addressograph-Multigraph Corporation—Cleveland and all principal cities of the world.

Addressograph and Multigraph are Reg. T. M. of Addressograph-Multigraph Corporation

Addressograph

TRADE-MARK REG. U.S. PAT. OFF.

SIMPLIFIED BUSINESS METHODS

Designing Molded Plastics Parts: RIBS BOSSES FILLETS

From the engineering files of One Plastics Avenue

Ribs, bosses and fillets are often essential to molded plastics parts. The following general factors should be considered in design specifications:

1. **Design ribs with ample section and sufficient draft or taper. A taper of 5° per side is desirable on all high bosses and ribs. Provide generous radii at top and base.**
2. **Large otherwise unsupported surfaces should be designed with ribs to provide adequate mechanical strength and minimize warpage.**
3. **Fillets increase strength of mold and of molded part, prevent lodging of compound in corners with resulting premature cure.**
4. **Mounting bosses should project at least 1/64 in. beyond other projections on molded part.**
5. **Ribs act as runners or feeders and may be used to flow materials to isolated bosses or projections.**

RIBS are used to provide strength, facilitate flow of material, or act as an electrical barrier. Ribs may be used on one or both surfaces. When ribs are used on inside surface of light-colored material, decorative ribbing on outer surface may be necessary to conceal lines or shadows.

For urea parts ribs should be as short as possible and of uniform thickness, approximating thickness of main section.

Control part in which ribs provide strength, bosses simplify mounting and assembly, and fillets improve moldability and appearance.

BOSSES are used for mounting or assembly. When four bosses are used for mounting molded parts it is usually necessary to grind their top surfaces flat. Three bosses are preferable as they do not require this finishing operation. For small bosses the height should not be more than 2 times the diameter. High bosses tend to trap gas, decreasing density and strength of molded part. For bosses in side walls of light-colored parts, decorative fluting on outer face will conceal any shadows or flow lines.

FILLETS (or radii) at base of ribs or bosses facilitate flow of compound and eliminate sharp corners which concentrate stresses in molded part.

Fillets on inside ribs or bosses minimize shadows or flow lines which may appear on outer surfaces.

Fillets frequently reduce mold costs, improve appearance of part, and eliminate dust traps which make part difficult to clean. They also improve the mechanical and dielectric strength of part.

Molded part should have at least 1/32 in. radius for all corners, with the exception of flash lines which should be sharp. Cold molded parts should have 1/16 in. minimum radii.

ADDITIONAL FACTS Proper design of ribs and bosses improves serviceability of molded parts and contributes to economical manufacture. G.E. offers a consulting engineering service based on experience, successful production and complete molding facilities. For additional information about plastics or for reprints of this advertisement, write section H-224, General Electric Plastics Divisions, 1 Plastics Avenue, Pittsfield, Mass.

192 000 employees of the General Electric Company are on their jobs producing more goods and buying over a million dollars of War Bonds every week to hasten victory.

Hear the General Electric radio programs: The "Hour of Charm" Sunday 10 P.M. EWT, NBC—"The World Today" news every weekday 6:45 P.M. EWT, CBS.

PD-224

PLASTICS DIVISIONS

GENERAL ELECTRIC

ALL TYPES OF FLUIDS... KEPT CLEAN... TO PROTECT VITAL EQUIPMENT

Cuno Filters, continuously cleanable, keep fluids continually clean, without delays for replacement

QUENCHING OIL

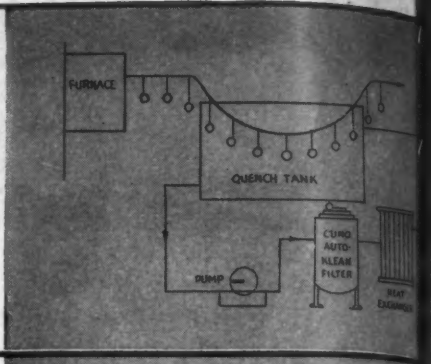
Process: heat treating of magnets for electric motors

Fluid: quenching oil at 100°F.

Cuno Filter: Auto-Klean with stainless steel internals

Replaced: large settling tank with 150 mesh screen

Results: more positive removal of scale . . . elimination of maintenance . . . saving in floor space



RIVER WATER

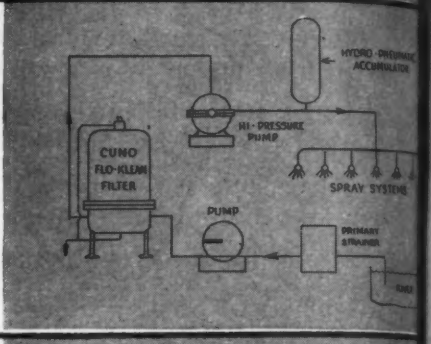
Process: general mill services in a metal plant

Fluid: river water containing waste from upstream plant

Problem: plant had been using city water, due to contamination of river water

Cuno Filter: Auto-Klean with stainless steel blades

Results: river water made useable . . . water bill reduced by 80%



RUST-PROOFING COMPOUND

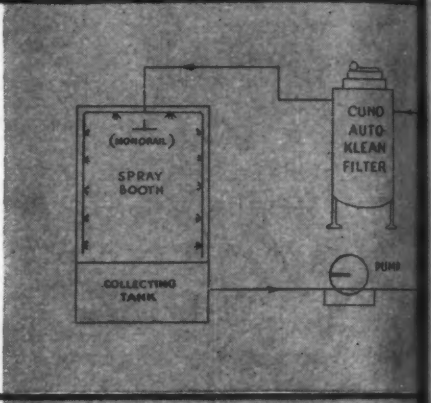
Process: degreasing and rust-proofing of truck chassis frames

Fluid: compound sprayed and recirculated

Problem: lint from workmen's gloves, grease and shop dirt plugged spray nozzles

Cuno Filter: motor-driven, handling 1200 G.P.M.

Results: eliminated plugging of spray nozzles; system now operates continuously



GRINDER COOLANT

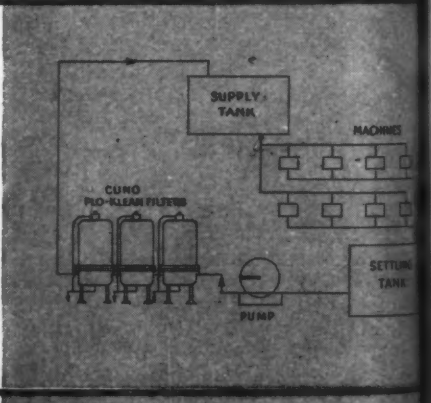
Process: grinding machines

Fluid: coolant consisting of water and soluble oil, drained to a settling reservoir, screened and baffled to stop coarse or floating solids

Replaced: wire strainer, which would periodically plug and burst

Cuno Filters: several motor-driven Flo-Kleans

Results: coolant kept continuously clean . . . no filter maintenance



CUTTING OIL

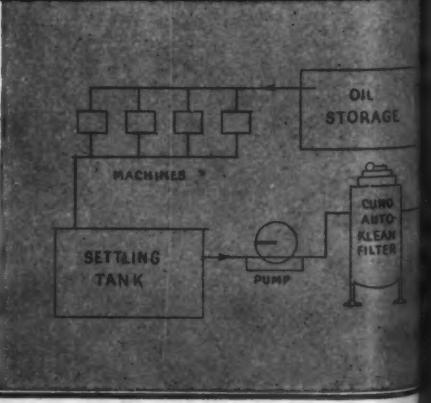
Process: gear hobbing machines

Fluid: cutting oil

Problem: absolute necessity for continuous flow of cutting oil; any interruption of machine operation would cause a tool mark at restarting point

Cuno Filter: self-cleaning Cuno provides essential capacity and constant flow for this critical service

Results: success on one job led to installation on many others



Cuno Auto-Klean and Flo-Klean Filters, filter many types of fluids from water to fuel tar and in a wide range of capacities from a few gallons per hour to thousands of gallons per minute.

2 CUNO TYPES FOR A BROAD RANGE OF FLUID-CLEANING JOBS

1. CUNO AUTO-KLEAN (DISC-TYPE):
For lube, cutting and quenching oils, water; and other industrial liquids.

Positively removes all solids larger than minimum size specified.

Continuously cleanable — manually or by motor; no costly flow interruptions.

Permanent, non-collapsible — all-metal construction (any machinable metal); no cartridge to replace.

Minimum pressure drop — permits installation on low pressure or gravity feed systems as well as all others.

Single installation adequate — no duplex installation required; compact — saves space.

"Comb-action" cleaning — cleaner blades comb out accumulated solids between discs; no clogging.

Maintenance negligible — manually-operated models require only occasional hand turning; motor driven models clean themselves.

Wide range — models for individual machines or largest centralized systems.

2. CUNO FLO-KLEAN (BACKWASH TYPE):
For river water, grinder coolant, and other liquids containing extremely abrasive particles.

Positive removal of solids larger than minimum size specified — with practically no pressure loss.

Self cleaning, continuously and automatically, without interruption of fluid flow — obviates expensive duplex installations.

No loss of backwash fluid. No seals to replace.

Permanent all-metal wire-wound, filter element resists corrosion and abrasion.

KEEP FLOW ON "GO" WITH

CUNO

THE "FILTER-FINE" STRAINER

☐ Send me free booklet, "Quick Facts"

☐ Send me free Pipe Flow and Filter Finder

CUNO ENGINEERING CORPORATION
601 South Vine Street, Meriden, Conn.

Name .....

Company .....

Address .....

Product to be filtered .....

WHIZ LIQUID HAND SOAP

"Friendly to the Hands"

A Cocoanut Oil Soap

Good soap not only cleans, but *protects* the hands. The best soaps are made from Cocoanut Oils. WHIZ Liquid Hand Soap—made by skilled laboratory technicians who *know* soap—includes maximum Cocoanut Oil content permitted by Wartime Regulations.

WHIZ Liquid Hand Soap is completely saponified—contains no caustic or harmful ingredients to injure the skin or cause dermatitis. Contains no useless fillers—is free from irritating "sticky" feeling. Has no "fishy" odor. It lathers freely, cleans thoroughly, leaves the hands soft and smooth. *Write Industrial Dept., R. M. Hollingshead Corporation, Camden, N. J., for your nearest distributor.*

Powdered Hand Soaps • Protective Hand Cream • Scrubbing Soap • Cleaners • Floor Waxes (Heavy Duty and Self-Polishing, Liquid Oil Base and Paste) • Odorless and Concentrated Insecticides • Furniture and Metal Polishes • Drain Pipe and Bowl Cleaner • HO-ZOF Degreasing Compound • Hydraulic Fluids • Rust Preventives.

Whiz Hollingshead

LEADER IN MAINTENANCE PRODUCTS

BUY MORE BONDS

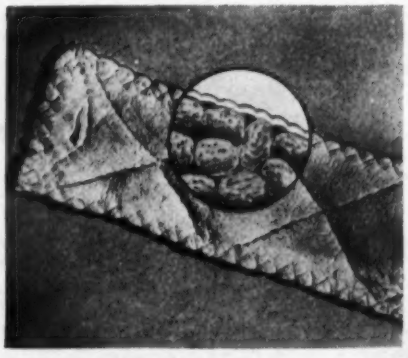
YOU WANT TO KNOW

more about the items mentioned on this page

Letters to the addresses given will bring information

•SOUND MOVIES for mass training in critical occupations, such as machine shop work, pre-flight induction training, office practice, and others for general educational use, have been released by U. S. Office of Education. Order form and price list obtainable from Castle Films, 30 Rockefeller Plaza, New York 20.

• "PRODUCTION FOR VICTORY" summarizes the achievements of American industry in the two years since Pearl Harbor. Increases in production, exports, and expenditures are clearly charted. "The feats of production speak for themselves and for the free men and women of America who have rolled up their sleeves to do a job and are doing it," states the foreword. National Association of Manufacturers, 14 W. 49th St., New York.



A LINING for goggles, chin straps, sweat bands, and other headgear has been developed which combines sponge clippings for their soft texture, and chamois skins for natural resiliency. With this padding, perspiration is absorbed, and soreness due to chafing is eliminated. Photograph shows an actual sweat band with cutaway view of the flat sponge clippings as they appear inside the chamois covering. James H. Rhodes & Co., 157 W. Hubbard St., Chicago.

•ABSENTEEISM has been the subject of extensive research by the George S. May Business Foundation, 111 So. Dearborn St., Chicago. The case of management and the case of labor are presented impartially, with the purpose of proving that practically all the problems presented by absenteeism can be solved by intelligent management and supervision.

•GLUING TECHNIQUE has been developed whereby heat is applied to a plastic in order to fix the plastic to a permanently hard, infusible, waterproof state. The process, which requires no plant conversion, strategic materials, or trained employees, is claimed to reduce setting time from eight days to about two minutes. Dr. W. Gallay, Colloids and Plastics Laboratory, National Research Council of Canada, Ottawa.

• WAGE EARNER opinion survey reveals current opinions and postwar plans of representative cross-section of Louisville workers. Answers reveal what wage earners are doing with earnings now, and what they plan to do after the war with their savings. The survey is meant as a starting point for further management planning based on increasing understanding of wage earners' problems. Citizens Union National Bank, Louisville.

•RAPID CALCULATOR slide rule for coil winding and RF resonance data, shows inductance, capacitance, and frequency components of series of parallel tuned RF circuits. Gives all combinations within 1 percent for coils ranging ½ to 5½ inches in diameter and ¼ to 10 inches in length. 25¢ each. Allied Radio Corporation, 833 W. Jackson Blvd., Chicago 7.

INTERNALLY INSULATED piping enables carbon steel pipe of ordinary weight and construction to handle high temperatures successfully, and to preserve heat. The lining material can be varied in thickness to meet conditions of temporary corrosion, erosion, and velocity in different installations. "Insidline" construction has been developed by Baldwin-Hill Co., Trenton, N. J.

•WAR-PEACE CONVERSION is the theme of "Getting Down to Earth," published by Corrigan, Osburne & Wells, Inc., Lincoln Building, New York. The outlook for industry during the next 25 years, new materials, processes of manufacture, and

TOOLS LEAD A DOUBLE LIFE

SUNICUT

increases tool life 100%... improves finish of parts

Tools can't take a holiday . . . not when there are guns to make, and bombers to build, and other war material to produce. But tools were taking holidays . . . far too many . . . for regrinding and resharpening at one of the largest mid-west war plants.

Production quotas were a headache to machine tool operators and foremen because the frequent "time-outs" for tool changes cut down the output. In addition the finish of the parts was not up to par. Many grades and brands of cutting oil were tested and tried, but all failed to correct the condition. So they called a Sun Doctor of Industry — a cutting oil expert — who studied the problem and recommended a change to Sunicut, the transparent, sulphurized oil.

Tools double parts produced for tool grind on many operations before they need changing . . . and the finish of the parts is everything that could be desired. Sunicut succeeded where the others failed.

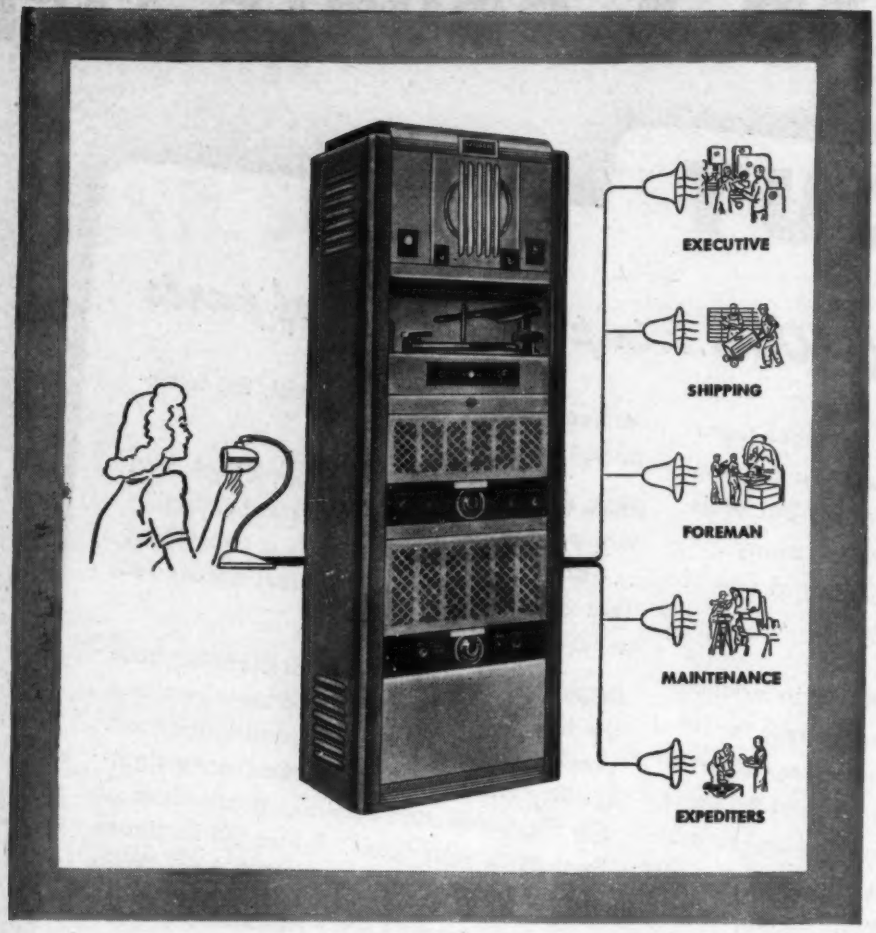
Output is stepped up in this war plant because the high heat-absorbing and metal wetting properties of Sunicut permitted longer tool life and finer finish. How about investigating the production-boosting possibilities of Sunicut in your plant? A Sun Oil Engineer will be glad to discuss it with you. Write

SUN OIL COMPANY • ***Philadelphia 3, Pa.***

Sun Oil Company, Ltd., Toronto, Canada

SUNOCO

SUN INDUSTRIAL PRODUCTS *HELPING INDUSTRY HELP AMERICA*



Get Out Those War Contracts—Use Voice-Paging to

FIND YOUR MAN FASTER

Have you ever realized how much production can be hampered . . . how much time can be lost trying to locate key men when they are needed? "Voice-paging" locates your man anywhere in the plant . . . in a matter of seconds! And *over the same system* goes plant *music*, for boosting morale and production! This standardized and "packaged" unit (Model S-525) comes *ready to plug in!* It embodies the most popular features of more elaborate installations . . . covers an area up to 100,000 square feet! It is your answer to the major problem of getting out the war supplies on schedule! Send for illustrated folder giving full details and names of companies using Operadio music and voice-paging equipment.

OPERADIO

Plant-Broadcasting

MUSIC AND VOICE-PAGING • BY THE MAKERS OF "FLEXIFONE" INTERCOMMUNICATION

PIN TO YOUR LETTERHEAD

OPERADIO MFG. CO., DEPT. F-9, ST. CHARLES, ILLINOIS

☐ Please send free literature describing Operadio S-525 Plant Broadcaster in detail—also new book "Music and Manpower."

☐ Have representative make appointment to survey our plant.

Name.....

Address.....

City..... *State*.....

qualities of product to be expected after the war, are discussed. Current conversion activities are investigated for the benefit of business men who have not yet started their post-war planning.

•PRACTICAL DESIGN FOR ARC WELDING contains time-saving suggestions for economical design of change-overs or new products. Not a textbook, but published for those already familiar with arc-welding fundamentals, the booklet leaves size and detailed specifications to be determined for the individual case. Loose-leaf in form, so that additional plates may be added. The Hobart Brothers Co., Box EW86, Troy, Ohio.

•NON-TECHNICAL discussion of a current problem is contained in "Just an Ordinary Guy Looks at Inflation," published by Cessna Aircraft, Wichita, Kan., for its employees. The questions: "What is inflation?" "How does it begin?" and "What can we do about it?" are answered briefly and lucidly. The urgency of checking this trend before it can gain further headway, is stressed.

•WANTED: 100 users of transparent prints. Ammonia process called VAPO-vel is available for trial purposes. Claimed to have passed tests for fading, keeping quality, printing and development speed, and sharpness of image. Frederick Post Co., Box 803, Chicago 90.

• SUGGESTIONS for shop or laboratory practice have been compiled in a booklet called "War Winning Suggestions in the War Production Drive." These ideas are classified according to industry, as well as according to the type of suggestion. Special sections called "Shop Shorts" can be put into use at once. Additional material is available on other sections. War Production Drive Headquarters, War Production Board, Washington, D. C.

• AN EMULSION of oil, water, and four undisclosed ingredients has been developed for protecting precision gages against wear and preventing their freezing to parts being gaged. Makers claim that a light brushing with the liquid reduces gage mortality 50 to 75 percent. Protective Coatings, Inc., P. O. Box 56, Strathmoor Station, Detroit 27.

• WARTIME MAINTENANCE problems are covered in "Operation and Maintenance Review," a pocket-sized, bi-monthly magazine illustrated with color cartoons. It contains maintenance tips from engineers, as well as timely articles on current trends for the shopman and the executive. It also invites an exchange of ideas on operation and maintenance from equipment users. Allis-Chalmers, Box 512, Milwaukee 1.

From green mold

—*a new weapon against death*

From the green mold that forms on bread and cheese, science has evolved a new bacteriostatic agent of extraordinary potency . . . ***penicillin,*** regarded as one of the most striking medical developments since the introduction of the sulfa drugs.

In the production of penicillin, *air conditioning and refrigeration* play essential roles at three important stages . . . maintaining correct temperature and humidity for production of the mold; providing low temperatures which prevent destruction of the drug while in solution; and speeding the dehydration of the solution.

Since penicillin production is relatively new, no standard process has yet been adopted. Hence air conditioning and refrigeration installations are usually individually designed. Here is *one* of the reasons why penicillin manufacturers turn to G-E . . . pioneers in adapting air conditioning and refrigeration to an almost endless list of industrial uses.

If industrial air conditioning or refrigeration can help you in war production today, or in postwar production tomorrow, turn to G-E with confidence . . . for engineering advice and for equipment of proven quality.

☆ BUY WAR BONDS ☆

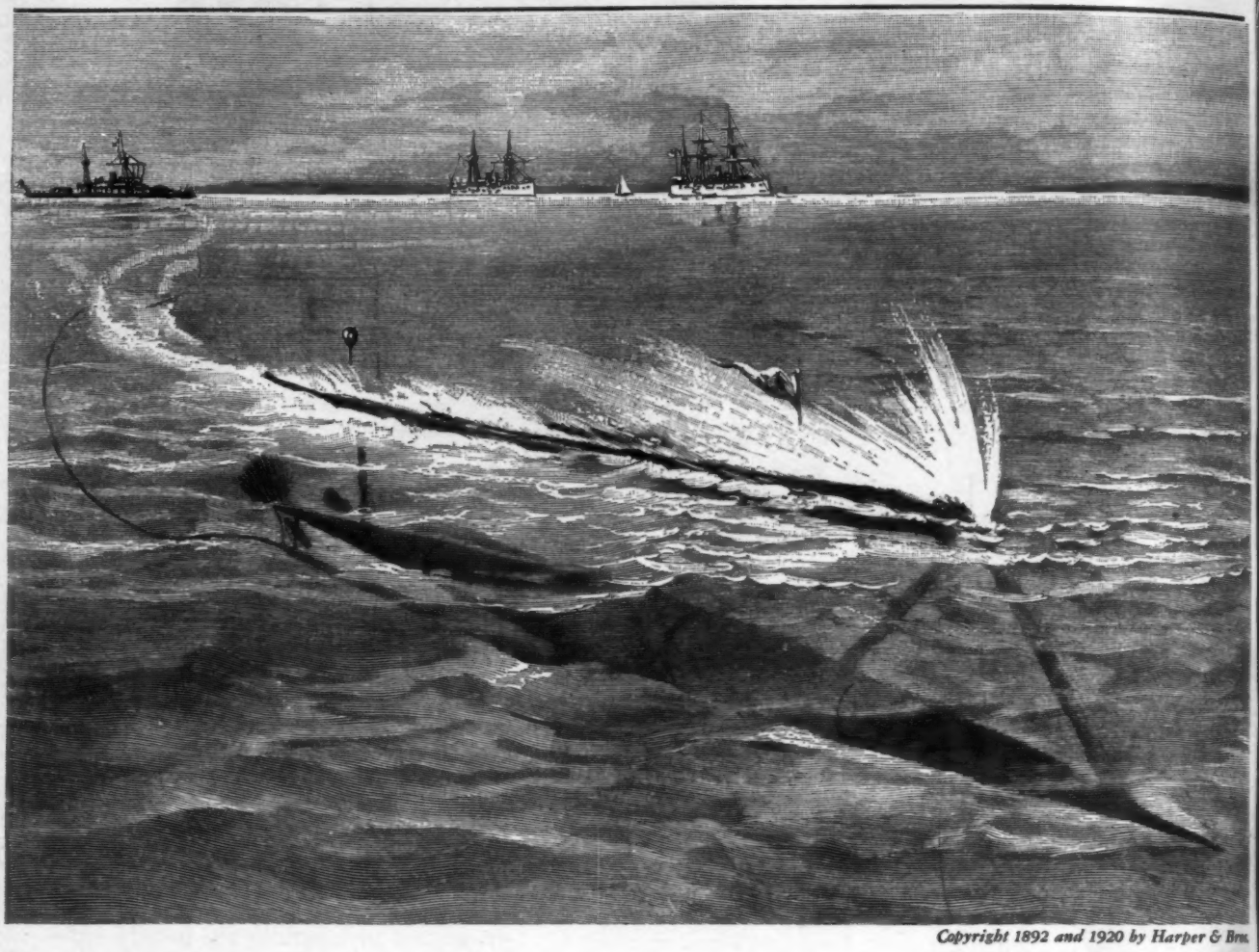
General Electric Company, Air Conditioning and Commercial Refrigeration Divisions, Section 441, Bloomfield, New Jersey.

Industrial Refrigeration by

GENERAL ELECTRIC

Hear the General Electric Radio Programs: The "G-E ALL-GIRL ORCHESTRA," Sundays 10 P. M., EWT, NBC... "THE WORLD TODAY" News, Every Weekday, 6:45 P. M., EWT, CBS

"This is a Grinding War . . ."



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EDISON'S FISH

Here's a "secret weapon" that never went to war. But it caused a lot of excitement back when Dad was a boy!

It was called the Sims-Edison electric torpedo—a motor driven torpedo supported by a float and controlled and powered through a long extension cord!

It's a far cry from Edison's fish to the modern pneumatic torpedo which contains thousands of moving parts, is built like a watch, costs around $20,000 and rolls off production lines in staggering numbers.

When you consider what an intricate mechanism the torpedo is—and that it is only one item on today's list of war weapons—can you but marvel at America's war output.

That output is a miracle of mass production that was made possible, in part, when, over fifty years ago, the first man-made abrasive was created and the grinding wheel became a production tool.

Since then, engineers have learned how to grind mechanical parts to split-hair accuracy. This accuracy led to interchangeability of parts. And interchangeability, in turn, made mass production possible.

Today you can't put your finger on a single weapon that flies, sails, rolls, shoots or explodes that isn't in some way touched by grinding. Knowing that "this is a grinding war", we at Carborundum are acutely conscious of our responsibility to war industry. And we are constantly striving to develop new ways in which grinding can serve you better.

As a result, many new war-born applications for cylindrical, centerless, surface, tool room and other forms of grinding have already been developed. They are speeding production of tanks, ships, machine guns, rifles, machine tools, shells, projectiles, optical lenses and thousands of other instruments of war.

But we are also mindful that grinding plays a part in the production of nearly every article built for peace and that today's grinding developments will have a wider application than ever after Victory.

* * *

Every hour this war is shortened will save $12,000,000. The lives it will save are priceless. So please remember that grinding wheels, too, are "Weapons for Production"... use them wisely to help end the war sooner.

The Carborundum Company, Niagara Falls, New York.

THE CARBORUNDUM COMPANY

CARBORUNDUM AND ALOXITE ARE REGISTERED TRADE-MARKS OF AND INDICATE MANUFACTURE BY THE CARBORUNDUM COMPANY

ORBITAL MOTION

MAKES STERLING SANDING BETTER THAN HAND OR ORDINARY MACHINE SANDING!

Grasp 4 pencils with the points resting on a sheet of paper. By quickly moving them in continuous circles you have illustrated the principles of orbital motion!

At a speed of 4500 oscillations per minute, the orbital motion of the sanding pad on the Sterling Sander moves thousands of abrasive grits in 3/16" circular orbits against the work.

Detachable sanding pad simplifies re-loading of abrasives. Several pads can be loaded at one time, kept near work, and be easily and quickly interchanged.

Cartridge type filter keeps out abrasive dust, increasing the life of the motor. Simply remove filter, tap lightly, then reinstall.

STERLING 1000 ELECTRIC PORTABLE SANDER

Here's a new sanding machine that assures results far exceeding hand or ordinary machine sanding in both quality and speed! Quickly producing extra-smooth surfaces on wood*, metal, plastics or composition, the Sterling 1000 Electric Portable Sander operates with exceptional precision and holds to extremely close tolerances without gouging or marring. The Sterling 1000 sands, laps and polishes with great ease. Vibrationless and light in weight, only one hand is needed to guide it over the work, and even hard-to-reach parts can be sanded over long periods without causing fatigue. Its balanced and counterbalanced design, 25% excess power capacity air cooled motor, and sealed cartridge type transmission unit assure trouble-free operation and long life.

Ask now for a free demonstration of the Sterling 1000.

**Sands equally well with, or across wood grains.*

ORBITAL MOTION PROVIDES THESE ADVANTAGES!

1. Each abrasive grain moves in same direction and at same speed so cutting is uniform over entire surface.
2. Each grain cuts a furrow which is crossed and re-crossed from different directions by furrows cut by adjacent grains making surface extra-smooth.
3. As each grain moves around its orbit all of its sharp corners and facets are forced to cut, utilizing fully all of its cutting ability.
4. Action causes minute fractures of weaker sections of grains, continually producing new sharp cutting edges.

STERLING TOOL PRODUCTS CO.
390 East Ohio Street, Chicago 11, Illinois

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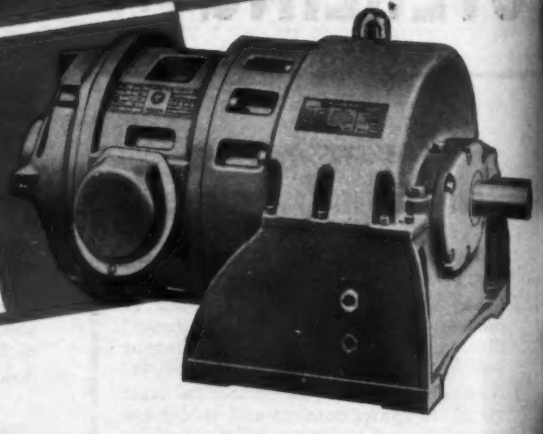
HERE'S WHY

Westinghouse Gearmotors

MEET YOUR POSTWAR DESIGN PROBLEMS TODAY

COMPACT—EASY TO MAINTAIN	Smooth, functional design of the new Westinghouse Gearmotor blends with modern machinery in any application. Gear case is split horizontally at shaft centers for easy inspection and maintenance.	NO "IF'S" ABOUT LUBRICATION	Gears and bearings are thoroughly lubricated by a positive splashing system. New gearmotor case design allows oil to circulate freely at all times. Only attention required is to change oil twice a year.
MOTORS INTERCHANGE TO MEET CHANGING CONDITIONS	Any NEMA frame standard type Westinghouse motor is interchangeable on the standard gear case. If postwar conversion requires moving gearmotor to new location, type or enclosure of motor can be easily changed to meet new conditions.	HEAT-TREATED GEARING —FOR LONG LIFE	"Tough-hard" teeth on surface for long wear—with tapering hardness through the metal, leaving the core tough and strong. Outside surfaces are made extremely hard to resist abrasion—inside cores are made extremely tough to withstand impact stresses.
HIGH EFFICIENCY	The efficiency of the new Westinghouse Gearmotor is high—only 2% loss is involved per gear set. Single reduction units offer 98% efficiency, double reduction units 96%.	EASY TO SELECT TO FIT THE JOB	The new Westinghouse Gearmotors meet A.G.M.A. recommended application practice which makes it easy to order matched gearmotors to any job—eliminates confusion in drawing up specifications.
COMPLETE DRIVE ASSEMBLY IN ONE UNIT	No separate handling, mounting and aligning of separate parts —just ONE unit which can be installed quickly, conveniently and economically.		

J-07215



For gearmotor application information, write for booklet B-3218. Address Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

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PLANTS IN 25 CITIES . . . OFFICES EVERYWHERE

Wasn't it always done this way?

P&H ZIP-LIFT HOISTS

No, Miss Victory, it wasn't!

You're one of thousands of women workers who'll never know the drudgery of old-fashioned materials handling methods—the fatiguing work this job formerly involved. Your Zip-Lift Hoist was installed to provide the simplest, safest way of lifting heavy parts on and off machine tools. Without it, this would be a back-breaking job—that's sure!

As more and more inexperienced men and women take their places in industry, management is providing a practical way to reduce basic training, to lessen fatigue, and speed production through simpler handling with the P&H Zip-Lift—the only small hoist with full magnetic push-button control. Write for literature.

Available in 250, 500, 1000 and 2000 lbs. capacities. Plugs in on any standard lighting circuit.

ARMY E NAVY

A new star has been added to P&H's award for excellence in war production.

General Offices: 4525 West National Avenue, Milwaukee, Wisconsin

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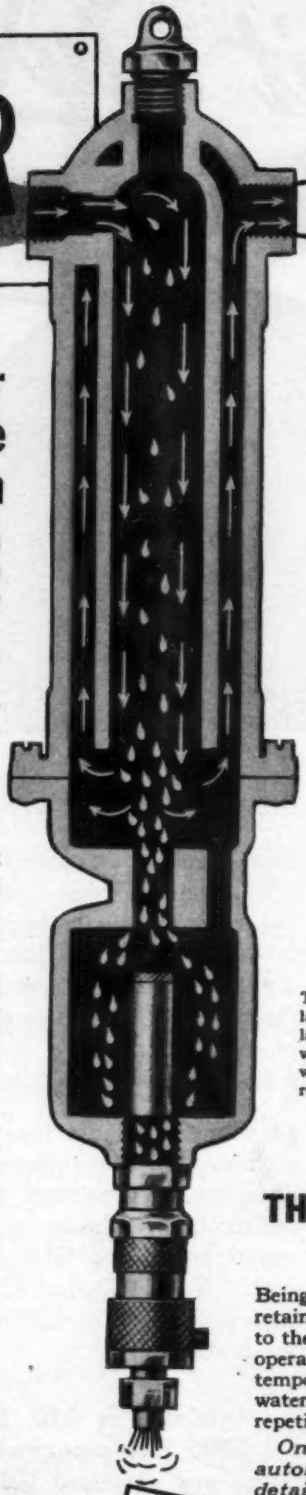
HOISTS • WELDING ELECTRODES • MOTORS P&H EXCAVATORS • ELECTRIC CRANES • ARC WELDERS

FREE AIR

Dehydrated and Cleaned!



Moisture and oil in your compressed air can raise the devil with war production

Precipitated moisture gets into tools, washes away lubricating oils and causes excessive wear. It produces "water hammer" in pipe lines and can easily result in loss of power, rust and ice formation. Water and oil in the air spoils work, such as spray painting . . .

They're a costly pair that take the "free" out of free air.

How to insure clean, dry air

The only sure way to insure a constant supply of clean dry air at every outlet is to provide separators that work automatically. Traps will not capture entrained moisture and oil while the air is in motion, and unless drained automatically of all moisture precipitated while the air is quiet will actually put moisture into the air as soon as this air reaches sufficient velocity. Manually operated traps, therefore, cannot *eliminate* the moisture and oil which is sure to be present, and the blow-off results in considerable lost air.

THE SWENDEMAN VENTING PRINCIPLE

The Swendeman Separator is scientifically designed to eliminate oil and moisture without retarding the flow of air or decreasing the pressure. It consists of a series of expansion chambers connected with an "Eliminator" which is vented to atmosphere. The Eliminator receives all moisture and foreign matter collected by the Separator, and expels it immediately, allowing the air no opportunity to pick it up again.

TYPE "A." Used in installations where pressure regulation is not necessary and where air may be shut off while valve and screen are removed for cleaning.

TYPE "C." Can be used on all work same as Type "A" but it has the advantage of the valve equipment between separator body and eliminator. This makes it possible to clean valve and not interfere with air supply beyond separator.

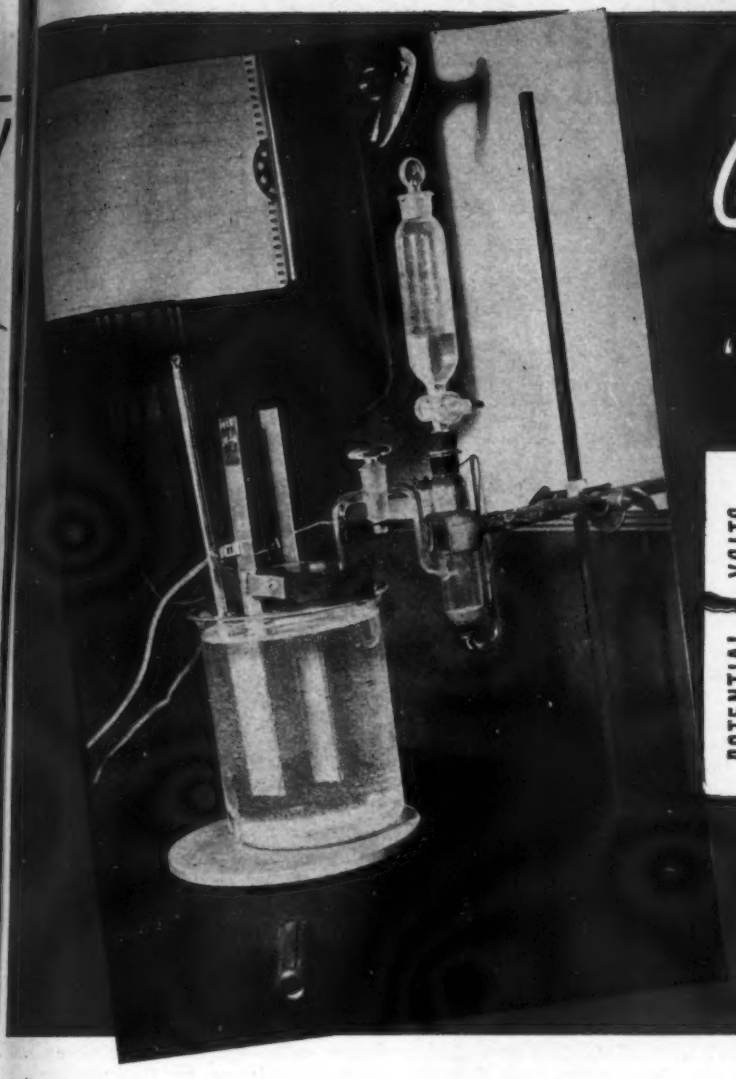
THE SWENDEMAN SEPARATOR IS NOT A TRAP

Being open to atmosphere at all times, the Separator retains no oil or water, nor permits these fluids to return to the line. Drawing off oil and water by means of hand operated valves or intermittent blow-offs affords only temporary relief, for as soon as the valve is closed, oil and water start accumulating again, necessitating frequent repetition of the operation.

Only the Swendeman Separator works on proved, automatic, result-getting principles. Write for detailed literature.

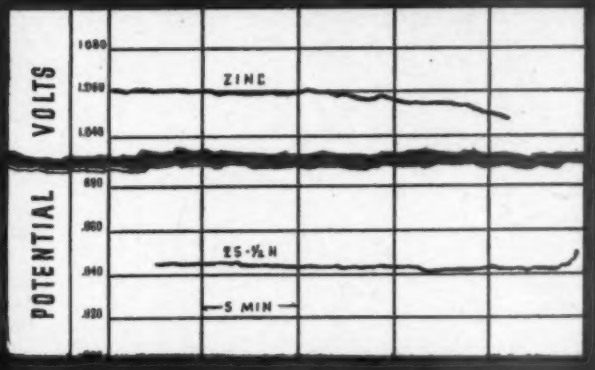
The LEAVITT MACHINE COMPANY
ORANGE, MASSACHUSETTS

SWENDEMAN Automatic Separator
A DEXTER PRODUCT



Cathodic Protection

"Will it work for me?"



This time-potential curve shows that zinc will protect the aluminum in the solution in question

. . .

Measuring and recording solution potentials of zinc and aluminum simultaneously under service conditions

All structural metals are affected to a varying degree by corrosive agents. Aluminum alloys, of course, are highly resistant to much of this attack, accounting for their widespread use in many types of equipment. But even aluminum sometimes requires extra care to extend its life—cathodic protection, inhibitors, protective coatings.

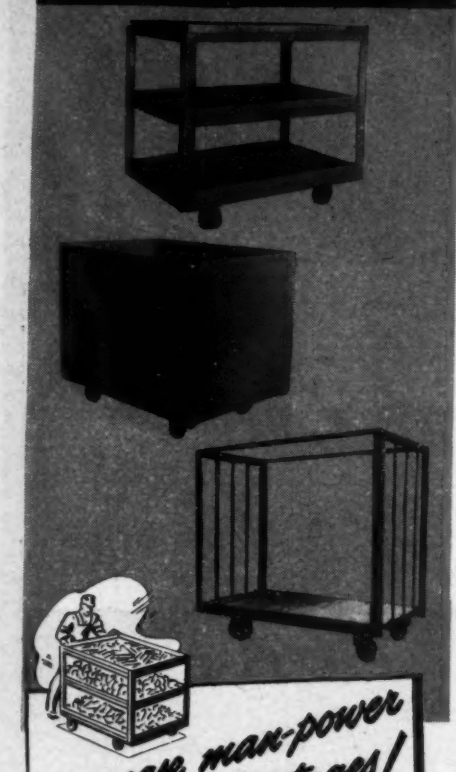
The airplane builder employs cathodic protection when he uses alclad aluminum alloy for the skin of his plane; the outer coating of this sheet electrolytically protects the inner, high strength aluminum-alloy core. Processing equipment is similarly protected when zinc strips are added to sidetrack the attack from the aluminum.

The question, "Will cathodic protection work for me", is continually being answered by Aluminum Research Laboratories for buyers of Alcoa Aluminum. The test is made by duplicating the materials to be employed in the equipment, and by simulating service conditions. If zinc proves anodic to the aluminum alloy, it is safe to say, "Cathodic protection will work there".

If you are wondering how to extend the life of your equipment, call on Alcoa. Our engineers and chemists have spent a lifetime perfecting ways of making Alcoa Aluminum Alloys serve best. ALUMINUM COMPANY OF AMERICA, 2126 Gulf Building, Pittsburgh, Pennsylvania.

ALCOA **ALUMINUM**

IRONBOUND
FLOOR TRUCKS



...ease man-power shortages!

You can effect savings in time and cost with this diversified line of floor trucks, skid platforms and semi-live skids. Included are table trucks, rack trucks, stake trucks, box trucks and shelf trucks. Skids and semi-live skids can also be fitted with various super structures. IRONBOUND units are constructed of steel, wood, or wood and steel to handle any job efficiently — large or small. Special attention is given to running gear to assure effortless, easy movement. Literature on request.

IRONBOUND BOX & LUMBER CO.
30 Hoffman Place, Hillside, N. J.

IRONBOUND
MATERIALS - HANDLING EQUIPMENT

Significant Labor Developments

Period Surveyed: November 10 to December 10

TREND INDICATORS

Premium Pay

Regional war labor board ordered a company to pay time and one-half for all hours worked on the sixth consecutive day, even though such hours did not exceed 40 a week.

While payment of time and one-half is permissible for work on the sixth consecutive day, but not compulsory, the regional board, ruled that a sixth-day premium was justified to avoid discontent among the employees, since it is the general practice in the area to pay time and one-half for work on the sixth consecutive day.

Employers should consider full-day and part-day absences as not breaking the sequence of consecutive days of work where they result from: (1) An accident sustained in the course of work; (2) a layoff by the company, except for justified disciplinary measures; (3) a request by the company that the employee remain off duty; and (4) activities by union officers and committeemen dealing solely with company-union relations.

The Secretary of Labor interpreting the Premium Pay Order pointed out that the six days worked need not be worked consecutively nor must the premium hours be hours in excess of 40 a week. Whether days or parts of days not worked should be counted in computing the sixth day of work is a matter to be settled by the custom or practice at the plant or by agreement.

Procedure Under Premium Pay Order

If there is a dispute involving the provisions of the Order, the union and employer should submit a joint statement of facts to Robert T. Amis, Special Assistant to the Secretary. If they cannot agree on the facts, the assistance of the Conciliation Service should be obtained. Disputes which cannot be disposed of by a ruling from the Secretary are to be submitted to WLB, which will refer them to the Joint-Department of Labor Committee on the Premium Pay Order.

Payment of premium rates specifically required by the Order does not require approval of WLB, regardless of the prior practice of the employer. This includes both double time for the seventh day of work in the regularly scheduled work week and time and one-half for six designated holidays.

Since time and one-half for the sixth day of work is not required, WLB approval must be had, if it was not the practice of the employer prior to October 3, 1942, to pay such a premium and neither state nor federal law required it. The Board, however, has by resolution granted blanket approval to the payment of time and one-half for the sixth day where it was the practice of the employer prior to the Premium Pay Order to pay such a premium for work on Saturday.

Treasury Bonus Rulings.

No application for approval is necessary to pay bonuses for the bonus year 1943 or subsequent years, if such bonuses meet any one of the following conditions:

1. If the employee's base salary has not been increased since October 3, 1942 (in the case of salaries of more than $5000 per annum), or October 27, 1942 (in the case of salaries of $5000 or less per annum), as the case may be, he may be paid a bonus which does not exceed the higher of the following amounts: (a) The dollar amount paid for the employer's last accounting year ended prior to October 3, 1942, or (b) the dollar amount of a bonus authorized under the Salary Stabilization regulations for the employer's first accounting year ending after October 3, 1942, provided the bonus does not exceed 50 percent of the base salary.

2. If the employee's base salary has been increased since October 3, 1942, he may be paid a bonus not to exceed the same dollar amount of bonus paid him for the employer's first accounting year ending after October 3, 1942, provided the bonus does not exceed 20 percent of his present base salary.

3. If the employee has been paid regularly, in accordance with an established policy of the employer, a bonus based on a percentage of base salary, such bonus payment may be made, regardless of dollar amount, provided the percentage has not been changed since October 3, 1942, or October 27, 1942, as the case may be.

4. An employee may also be paid a bonus that, together with all other compensation for personal services, does not increase his total compensation for the current year over the total earned in the calendar year 1941 by more than (a) 15 percent, if the total compensation for the year 1941 was $2400 or less; (b) 10 percent, if the total compensation for the year 1941 was over $2400 but not over $4000; (c) 5 percent, if the total compensation for the year 1941 was over $4000 but not over $7500.

Base salary for purposes of this state-

★ ★ ★ THIS *Self-Powered* SCRUBBER-DRIER

It surely gets around! Independent of power lines, this cableless, gasoline-powered *speedster of the floorways* has full freedom of range . . . is free to go wherever the operator guides it. Scrubbing and drying the floor in one operation, this heavy duty *Finnell* has a cleaning capacity up to 15,000 sq. ft. per hour! Actually does the work of a whole crew, *and then some.* A timely solution to the man-hour problem confronting the nation's huge war plants in connection with vast-area floor cleaning.

This Scrubber-Drier mounts a one-cylinder, four-cycle motor, air-cooled, and is equipped with powerful squeegee and vacuum pickup. Squeegee is of the new 'V' type, affording maximum efficiency. The machine is of heavy duty construction throughout.

For literature, free floor survey, or consultation, phone or write nearest *Finnell* branch or Finnell System, Inc., 2501 East Street, Elkhart, Indiana.

FINNELL SYSTEM, INC.

Pioneers and Specialists in

FLOOR-MAINTENANCE EQUIPMENT AND SUPPLIES

BRANCHES IN ALL PRINCIPAL CITIES

Precision-made Darnell Casters with the DOUBLE BALL-BEARING SWIVEL assure a long life of efficient, economical service

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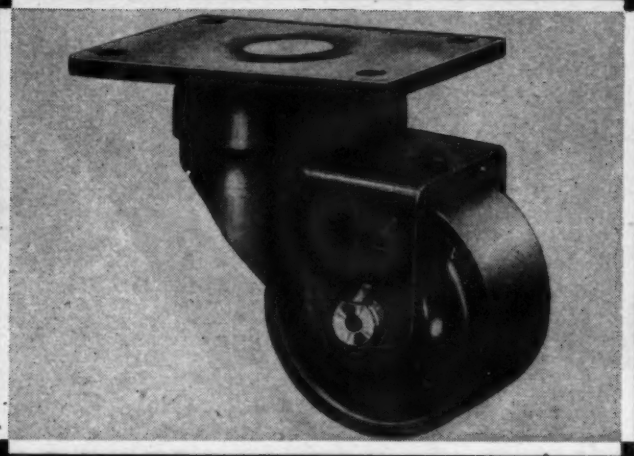

CASTERS & WHEELS

A SAVING AT EVERY TURN

DARNELL CORP. LTD.,
LONG BEACH, CALIFORNIA,
60 WALKER ST., NEW YORK, N.Y.
36 N. CLINTON, CHICAGO, ILL.

ment means salary exclusive of bonuses and other forms of additional compensation paid.

General Policies Governing Overtime and Increases

The Salary Stabilization Unit (SSU) requires gradually tapered overtime payments varying from 30 percent of the base salary for employees receiving $2600 annually to 2.5 percent of the base salary for employees receiving between $4600 and $4800. Employees earning more than $4800 are not granted any overtime bonus.

A new employee may be employed at any salary commensurate with his ability and experience, within the limits of the established salary range; he is not limited to the salary paid to the employee replaced. This is contrary to a former regional office ruling that a new employee's salary must be set at the minimum of the appropriate salary range unless approval to pay a higher rate has been obtained.

Penalty Payment Compulsory

Even though an employer had voluntarily made restitution of back wages to employees upon express assurances by the Wage and Hour Division that the payments were all he would be required to make under the Act, he is still liable for double damages. The penalty is to be assessed against him regardless of his good faith or the reasonableness of his belief that no overtime compensation was owed. (Rigopoulos vs. Kervan, CCCA-2.)

Wage Formula Not in Conformity With Wage-Hour Law

The Circuit Court of Appeals disallowed that the so-called "X formula" designed to provide a constant wage, through the establishment of a specified weekly wage which was to be equal to 40 hours times "X" cents per hour plus the number of overtime hours times 1½ "X" cents per hour; if the result showed "X" to be lower than the statutory minimum, the latter would be taken as the regular rate of pay. The fallacy of the formula, the Court held, lies in the fact that such a contract does not meet the overtime pay requirements of the Fair Labor Standards Act, since it does not fix in terms of dollars and cents any regular rate or overtime rate of pay. Neither the employer nor the employee knows the overtime rate until the end of the week arrives, and at that time all the formula provides is a means of arriving at a regular rate which, combined with the overtime rate, equals the agreed weekly wage. (Walling vs. Helmerich & Payne, Inc.)

WAR LABOR BOARD

**Back Dues Required Before Employee May Resign*

WLB Shipbuilding Commission requires paid-up dues before an employee may re-

* In this and the following classification items marked with an asterisk also are considered to be trend indicators.

New Nonpareil Turbine Oil | Used Nonpareil Turbine Oil | New Conventional Turbine Oil | Used Conventional Turbine Oil

The samples pictured show new and used Nonpareil Turbine Oil, and new and used conventional oil which have operated under identical conditions. The dark color of the used conventional oil sample shows the formation of soluble asphaltic and acidic substances, while the used Nonpareil has only been stained by dirt in the circulating system.

Protection against both turbine deposits and corrosion

IT IS NOT HARD to find an oil that will prevent corrosion. Some black oils have good rust-proofing qualities. Even used turbine oils have been found better than some new oils in this respect. But here's the difficulty. Oils that have natural corrosion-preventing qualities are not entirely suitable for turbines, because they may cause deposits. When these oils are refined to remove *all* the deposit-forming substances, the natural corrosion inhibitors are also taken out. Oils that give *complete* protection against both deposits and corrosion do not "grow." They must be *made*. Here's how the dual problem is solved in Nonpareil Turbine Oil.

Control of turbine deposits. Turbine oil troubles are caused chiefly by two types of hydrocarbons in oil—asphaltene and acid-formers. The elimination of these two types of trouble-makers is also a two-handled problem. The asphaltenes can be removed by highly refining the oil. But such refining increases the acid-forming tendencies. From this, it is evident that the use of highly refined oils alone merely means trading deposit problems for another type of problem.

The key to solving this problem was a unique inhibitor developed by Standard Oil for controlling acidity in an oil from which all asphaltene-formers have been removed. The use of this inhibitor under a patented process makes it possible for us to guarantee in writing that the acidity in Nonpareil Turbine Oil will not increase above the extremely low limit of 0.15 mgKOH/gm for the life of your turbine. The effectiveness of this method of eliminating deposits is demonstrated by turbine service records in which Nonpareil is still operating after 16 years without sweetening, treating, or replacing, and with no sign of troublesome deposits.

Control of corrosion. The problem of corrosion resistance in turbine oils, as stated before, is accentuated by the high degree of refining necessary to remove the asphaltene-formers. Such refining removes the natural corrosion inhibitors in the oil. Few inhibitors have been discovered which restore anti-corrosion properties without impairing other desirable qualities. This is also the objection to the addition of small amounts of used oils to fresh oils.

A corrosion inhibitor has been used in Nonpareil Turbine Oil since 1926. But a continuous study of this problem has been carried on. Hundreds of materials have been examined and thousands of tests made. An improved corrosion inhibitor is now used in Nonpareil which meets all requirements of corrosion protection without impairing other desirable qualities.

Recently the American Society for Testing Materials developed test D665-42T for determining the ability of turbine oil to aid in preventing the rusting of ferrous parts in the presence of water. Nonpareil Turbine Oil passes this test with perfect results.

Why Nonpareil eliminates both deposits and corrosion in turbines:

1. Nonpareil is a highly refined oil from which all asphaltene-formers have been removed. This eliminates the most common type of deposit found when conventional turbine oils are used.

2. Nonpareil contains an inhibitor which prevents acidity increase, and is guaranteed not to exceed 0.15 mgKOH/gm. This assures freedom from emulsions and deposits that occur when unprotected highly refined oils are used.

3. Nonpareil contains a thoroughly tested corrosion inhibitor, and passes the recognized test for corrosion prevention with a perfect test strip.

Get all the facts. A Standard Lubrication Engineer will be glad to supply full test data and service records on Nonpareil. Call any Standard Oil Company (Indiana) office, or write 910 S. Michigan Ave., Chicago 5, Illinois. In Nebraska, address Standard Oil Company of Nebraska at Omaha 2.

Oil is ammunition . . . Use it wisely

★ NONPAREIL TURBINE OIL ★

STANDARD OIL COMPANY (INDIANA) STANDARD SERVICE

LUBRICATION ENGINEERING • • LUBRICATION ENGINEERING • • LUBRICATION ENGINEERING • • LUBRIC

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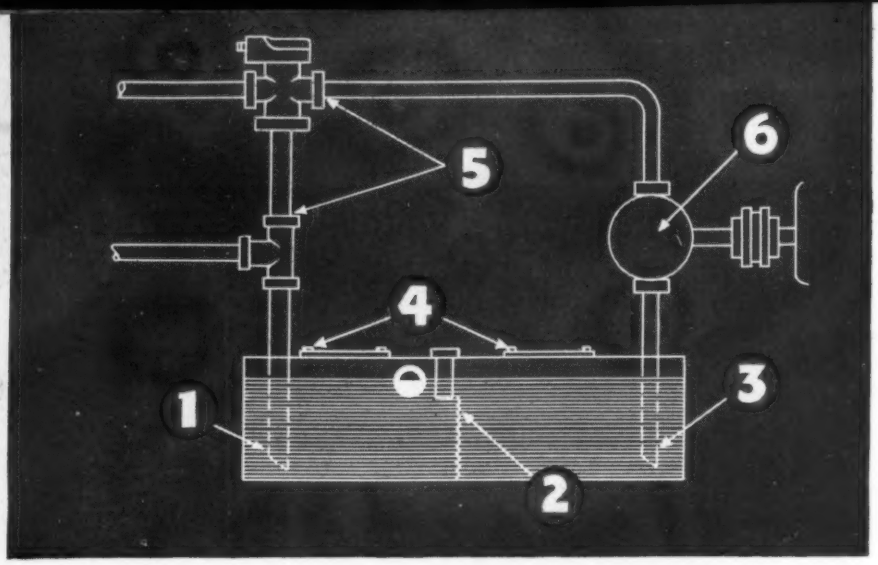

Hydraulic Oils and how to select them

Troubles in hydraulic system operation are not always caused by the oil used, but many of them can be avoided by using the right oil. Here are some suggestions for selecting the right hydraulic oil:

WHAT TO AVOID

Viscosity too high. Most easily detected when starting the unit, by sluggish operation and delayed circulation, which may damage the pump. When operating, too high a viscosity may cause over-heating and rapid oil oxidation. **Viscosity too low.** Indicated by low pressure, erratic operation. It frequently causes leakage at packings and glands. Excessive wear may develop because lubrication is inadequate.

Poor stability. Conditions under which hydraulic oils operate (heat—pressure—aeration) tend to cause the oil to oxidize and form deposits in the system. These deposits cause wear on pumps and valves, and erratic operation, which can only be corrected by an expensive cleaning operation. Deposits caused by oil oxidation should not be confused with those caused by contaminants entering the hydraulic system.

Poor demulsibility. Although normal precautions are taken to keep moisture and coolants from entering the hydraulic system, some oils will emulsify in the presence of even a small amount of moisture. The resultant frothy mixture is compressible, causing a loss of pressure and poor control of operation.

WHAT TO LOOK FOR

High Viscosity Index. Hydraulic pump and motor manufacturers have definite viscosity recommendations for oil used in their equipment. But for further protection, you need an oil of *high viscosity index*—an oil that resists changes in viscosity with changes in operating temperatures. Stanoil, for example, flows readily at starting, yet maintains suitable viscosity at the required operating temperatures.

High stability. There are many reasons why oils oxidize. Briefly, petroleum consists of various hydrocarbons, some of which unite readily with oxygen. This is called oxidation. The problem is to remove these unstable hydrocarbons. This has been accomplished in Stanoils by a unique refining process. Frequent cleaning of oil system, and oil changes necessary because of oil oxidation, are materially reduced with Stanoil.

Ease of separation from water. An oil must have good demulsibility—must separate readily from water so it will not form oil and water emulsion. Stanoil has this quality. With reasonable care to keep out dirt, Stanoil will not emulsify and can easily be separated from any water in the system.

These are just a few points to check in choosing a hydraulic oil. Let a Standard Lubrication Engineer help you pick the right grade and type of oil for your specific hydraulic jobs. Write Standard Oil Company (Indiana), 910 South Michigan Avenue, Chicago, Illinois, for the Engineer nearest you.

Tips on a typical hydraulic system installation

1 **Oil return line** must discharge below oil level to prevent formation of air bubbles which would cause erratic operation of the pump.

2 **Baffle plate** installed between intake and return discharge helps settle out any dirt in the system and remove air bubbles introduced when filling.

3 **Oil intake pipe** should extend to within two diameters of the bottom of the reservoir, to reduce the possibility of air entering the system if the oil level is low.

4 **Hand holes** are recommended to facilitate inspection of oil and cleaning of oil reservoir, but they must be tightly sealed to prevent entrance of contaminants and water into the system.

5 **Pipe joints** should be made positively leakproof to prevent entrance of water or air and the loss of oil and pressure.

6 **Hydraulic pumps** are accurately machined units. Their continuous, efficient operation depends upon how this accuracy is maintained. The best installation can be a continual source of trouble unless a clean oil of high quality, high stability, and the right grade, is used.

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sign from the union under an escape clause. In justification, the Commission observes that in awarding maintenance of membership for the duration of a contract, it does not mean that it is effective for the first few months of a contract and that subsequent delinquency can be lightly overlooked by withdrawal from the union during a new "escape period." It is only reasonable and equitable, if maintenance of membership is to have any meaning, that as a condition of withdrawal a member must have paid up his proper obligations to his union for the period during which he voluntarily bound himself to membership.

*Union Security Rule Modified

Regional War Labor Board, deviating from the customary form of maintenance-of-membership clause, awarded a clause which provides that only those employees signing a written pledge to remain a member of the union shall be required to do so. The purpose of modifying the clause (requiring it only on a written pledge) was to make the union security award more palatable to the company which was violently opposed to the inclusion of any union maintenance clause. (Thomas Somerville & Sons Company.)

*Fifteen-Day Escape Clause Inserted

WLB ruled that the provision for a 15-day escape period should be included where a maintenance-of-membership clause is removed, since the original clause was binding only for the duration of the contract. WLB felt that employees should be given an opportunity to resign from the union when the contract terminates. (Federal Shipbuilding & Dry Dock Company.)

*Compulsory Check-Off

NWLB affirmed a Regional Board ruling that once a membership-maintenance clause is ordered, a compulsory, non-revocable check-off should likewise be adopted by the employer. (National Carbon Company.)

Grievance Procedure

Grievances need not be submitted only through a union representative. They may be submitted by any employee directly to a company representative. (Aluminum Company of America.)

*Test for Rare and Unusual Rule

San Francisco Regional WLB warned that it will invoke the "rare and unusual" rule (allowing increases) only when the applicant can establish by overwhelming evidence that he is engaged in critical war production and that he has exhausted every available means for satisfying his manpower needs.

Wage Increase Granted

WLB unanimously denied a wage increase of 10 cents an hour; granted operating employees 5 cents an hour, non-operating employees 10 cents an hour, and increased

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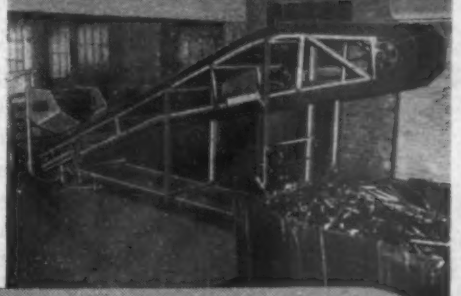

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student operators (trainees) to 65 cents an hour retroactive to May 16, 1943; and, in accordance with the application, these increases are to apply only to those employees who are in the service of the employing companies on the date of this final order of WLB. (Los Angeles Railway Corporation.)

Official Ceiling for Substandard Rates

WLB established 50 cents an hour or $20 a week as the official dividing line between standard and substandard wages.

**Little Steel Formula Limited*

WLB's Little Steel formula will not be applied in cases involving commission paid employees. The rule is announced in view of the difficulty of applying the Little Steel formula to commission payments because of the complexity of types of commissions and the general practice of not keeping hours-records for commission-paid employees.

**Reduction in Hours Permitted*

NWLB permitted a reduction in weekly hours from 44 to 40 for one group of employees without requiring a reduction in pay, even though no wage increase was allowable under stabilization policies. Since other employees in the plant were working a 40-hour week, it reasoned, to require another group to work 44 hours would be discriminatory.

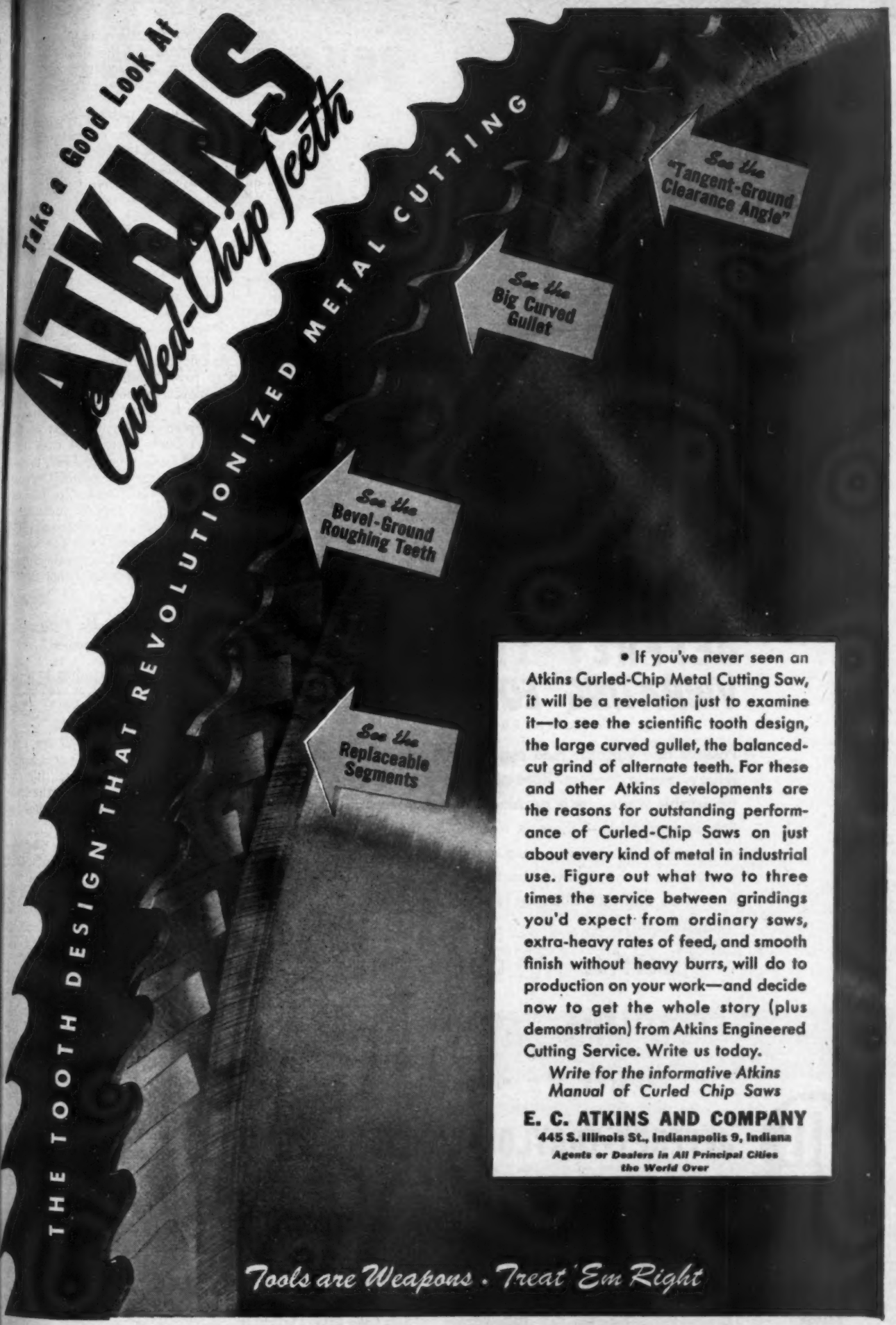
Reduction in hours from 53 to 48 without a corresponding pay decrease, made without the consent of the employees who, at the time, were not represented by a union, was sustained on the ground that this reduction in hours constituted a social gain rather than a wage increase.

**Incentive Bonus Plan Approved*

WLB approved an incentive plan for payment of bonuses for both production and non-production employees since the plan submitted satisfied all basic requirements, involved no increase in labor costs, and contained no hidden wage increases or decreases. The plan called for payment of a monthly premium to each employee based on an increase in production over and above a predetermined standard which was set on terms of allowed hours per plane for the factory as a whole and for major sections of the planes. A percentage figure representing one-half of the increased production, as measured by actual hours worked compared to the standard for a given output, and based on a three months' average preceding the payroll period, is to be applied to the total monthly earnings of every employee who is covered by the plan.

**Incentive Pay Plans*

RWLB dismissed a request for approval of an incentive plan providing for an 8 percent bonus for all employees of a company on the ground that the plan entailed an increase in labor costs. The principal faults in the plan were said to be is failure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to provide for variations in the type of product produced and the lack of an adequate standard, because that used was based upon a low rather than a normal production period.

In another case, RWLB approved an incentive plan after the company demonstrated that its adoption would result in a reduction in unit labor costs together with a quicker and more accurate testing policy. (Westinghouse Electric & Manufacturing Company.)

*1943 Bonus Payment Regulations

The general intention behind these regulations is to keep the method of bonus payments in 1942 in force for 1943. The preceding bonus year is defined as the year, calendar or fiscal, immediately preceding the year, calendar or fiscal, in which it is desired to pay a bonus. Changes in personnel do not affect bonus payments, new personnel are included under the terms of the bonus plan already in effect in the company. A bonus plan must have been in effect prior to October 3, 1942, to permit payment of bonuses in 1943 without Board approval. The payment of bonuses in 1941 or prior years does not in itself entitle the company to pay bonuses in 1943, if no bonus was paid in 1942. The following, although based on the announcement by the New York Regional Labor Board, is the prevailing guide.

Bonuses Which May Be Paid Without Board Approval

If a bonus was paid according to a certain logical method in 1942, it may be followed, but not altered, in 1943. These methods are:

1. *Fixed Dollar Bonuses*—If in 1942 each employee received the same bonus, regardless of position, salary, etc., the employer may give all his employees the same bonus in 1943 as in 1942, regardless of salary increases during the year.

2. *Geared to Wage or Salary Rates*—Bonuses that were a fixed percentage of salary in 1942 may be paid in 1943, providing the percentage of wage or salary remains unchanged. Under this method of bonus payment an employee may receive a larger bonus if he received a wage increase during the year.

3. *Fixed Amounts Based Upon Length of Service*—Bonus payments based upon length of service paid in 1942 may again be paid in 1943, providing the size of the bonus for each period of service remains unchanged. Under this method an employee who remains with the firm may receive a larger bonus than he received last year.

4. *Fixed Amounts Based Upon Job Classification*—Bonuses paid in 1942, varying according to job classification, may be given in 1943, providing the amount given to the employees in each classification remains unchanged. Under this method an employee who has been promoted may receive a larger bonus; similarly, a demoted employee receives a smaller bonus.

5. *Bonuses Geared To Profits*—If in 1942 an employer set aside a fixed per-

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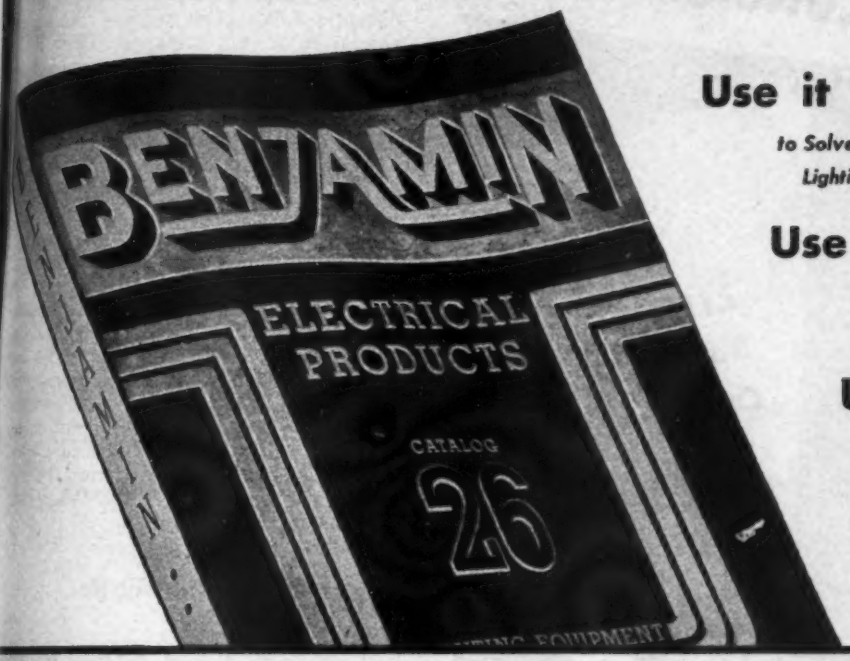

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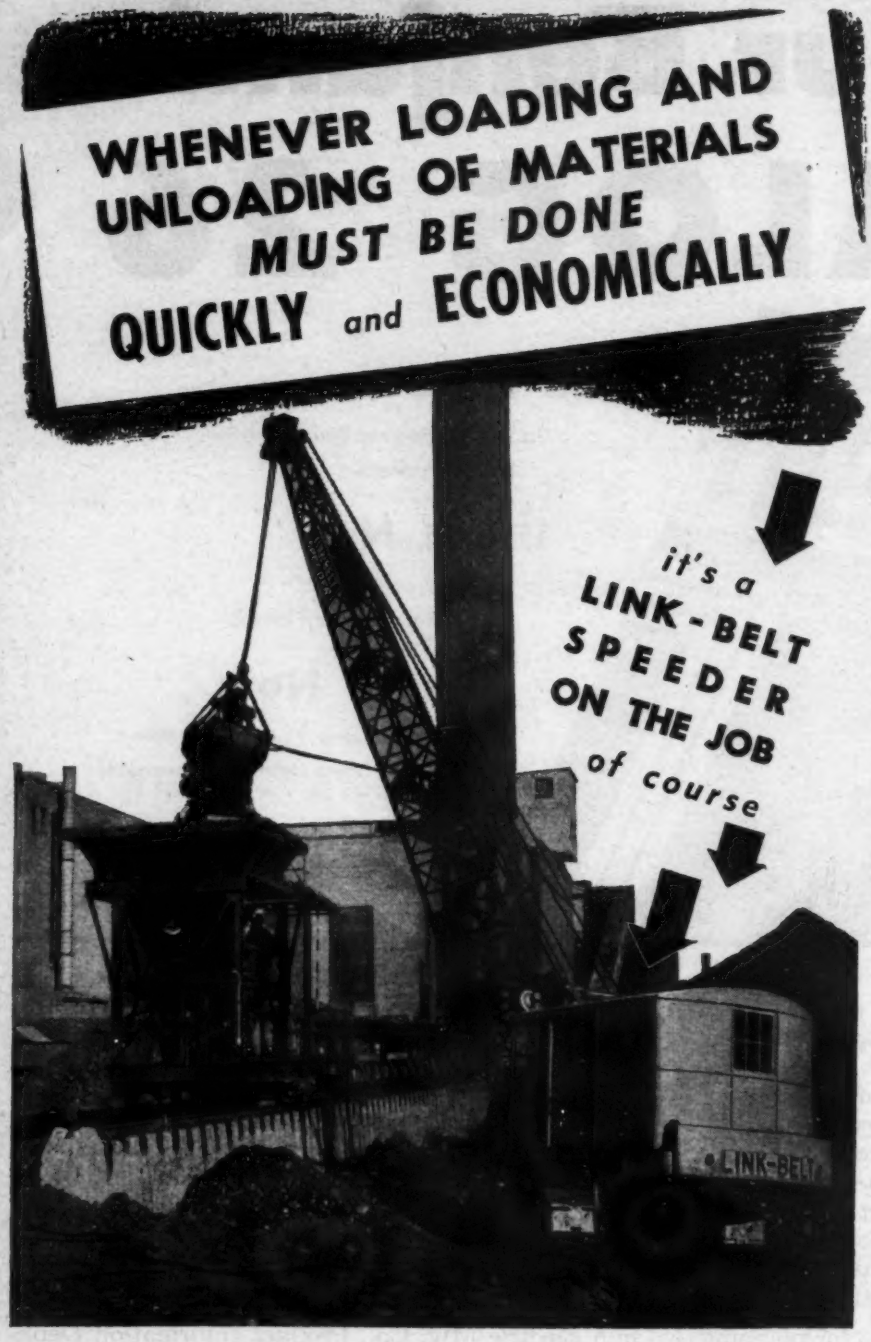
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centage of profits for distribution as bonuses among his employees in proportion to their share of the total payroll, he may, in 1943, set aside the same percentage of profits, regardless of whether profits are larger or smaller than in the previous year. Under this method, if profits have increased, employees may receive a larger percentage of their salary as bonuses; in the case of an individual raise, an employee may also receive a larger bonus.

If profits are lower, an employer may discontinue this plan and pay the same percentage of each employee's salary that he paid in 1942, even if this requires a larger bonus pool.

6. *Bonuses Based Upon Merit*—Bonuses distributed according to merit in 1942 may again be distributed according to that plan in 1943, provided the method of determining the bonus pool in 1943 remains unchanged. A merit plan which has no relation to salary must be based upon a logical principle, and must be accompanied by contemporary written records explaining the principle. The size of the pool from which the bonus is distributed must be either a fixed sum or a fixed percentage of profits unchanged from the previous year.

All bonus payments which do not come within the strict terms of General Order No. 10, as outlined above, must be requested on Form 10 with the Wage and Hour Office for approval.

Bonuses That Will Not Be Approved

1. Increased bonuses designed to correct maladjustments under the Little Steel formula.

2. Increased bonuses designed to correct substandards of living.

3. Increased bonuses to aid in the effective prosecution of the war.

4. Increased bonuses to repay an employee for having exerted more effort or for having assumed additional responsibilities in the same job during the last year (1943).

5. Any increase in the hourly, weekly, or monthly rate cannot be made by converting a bonus payment into an hourly, weekly, or monthly salary increase.

6. An employer may not pay the Victory, withholding, or other taxes imposed on a bonus, providing it represents a change in the employer's practice.

**Bonus to New Employees*

New employees may be paid bonus without prior Board approval if the bonus is an amount equal to that paid to employees in comparable occupations.

**Amount of Bonus Allowed*

RWLB, interpreting General Order No. 10, announced that if, for the year 1942, an employer paid a bonus, not based on percentage, incentive, or any like basis, in a smaller amount than he paid in 1941, he may not in 1943 pay the amount paid in 1941 rather than the smaller amount paid in 1942. The bonus may not exceed

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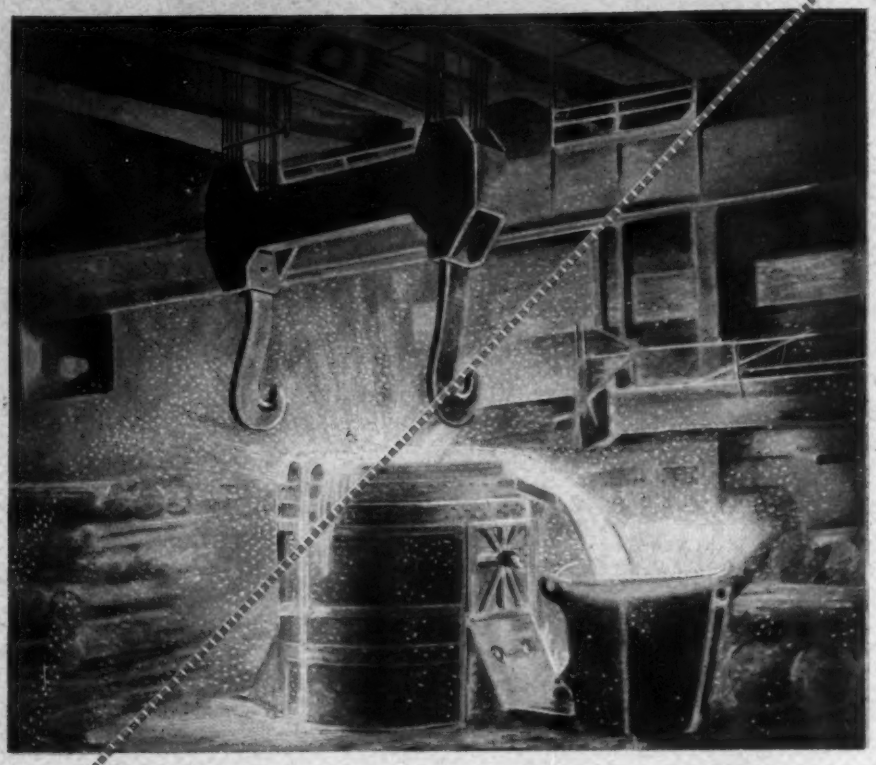

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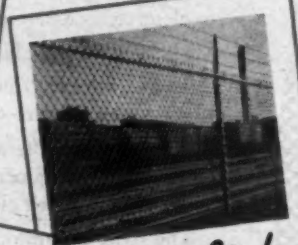

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in amount that paid in the preceding year, 1942.

Where a bonus is computed on a percentage or similar basis and this method yields a smaller amount for the year 1943 than was paid in 1942, the employer may, if he chooses, pay in 1943, the same total amount that was paid in 1942.

*Bonus Plan Approved

RWLB aproved a bonus plan for employees who bring new employees to the plant. The plan awards to the recruiter $2 if the new employee remains one week, an additional $5 if he remains a month, and an additional $10 if he continues for four months.

*Bonus as Part of Wages

In one case WLB approved an attendance bonus where all other efforts to combat absenteeism had failed. In that case the Board was satisfied that all other methods of combating the critical labor shortage had failed, that the increase in straight-time earnings amounted to only 1½ cents an hour, an increase which could hardly be called inflationary, and that the proposal was for approval for only a 6-month period, in the nature of an experiment.

In another case it refused approval since it decided that such bonus payments would do little to reduce absenteeism and would be incompatible with the Wage Stabilization program.

*Abandonment of Bonus Permitted

The National War Labor Board overruling the regional board held that customary bonuses may be abandoned where special reasons are shown. In determining whether a company was justified in abandoning a bonus the Board will consider the following questions: (1) What is the nature of the bonus? (2) How regularly has it been paid in the past? (3) Under what circumstances generally known to the employees has it been paid in the past? and (4) Were these circumstances present when discontinuance of the bonus gave rise to the dispute between the parties?

*Union Penalized for Strike Pledge Violation

NWLB summarily canceled maintenance-of-membership and check-off clauses from a union which went out on a 9-day strike after the clauses were awarded by the RWLB. (Commercial Solvents Corporation, WLB.)

NATIONAL LABOR RELATIONS BOARD

*Rights of Picketing Extended

The U. S. Supreme Court, reversing the New York Court of Appeals, decided that an injunction against the peaceful picketing by union members directed against restaurants which had no employees, violates the constitutional right of free speech. In an effort to compel the restaurants to hire employees and select

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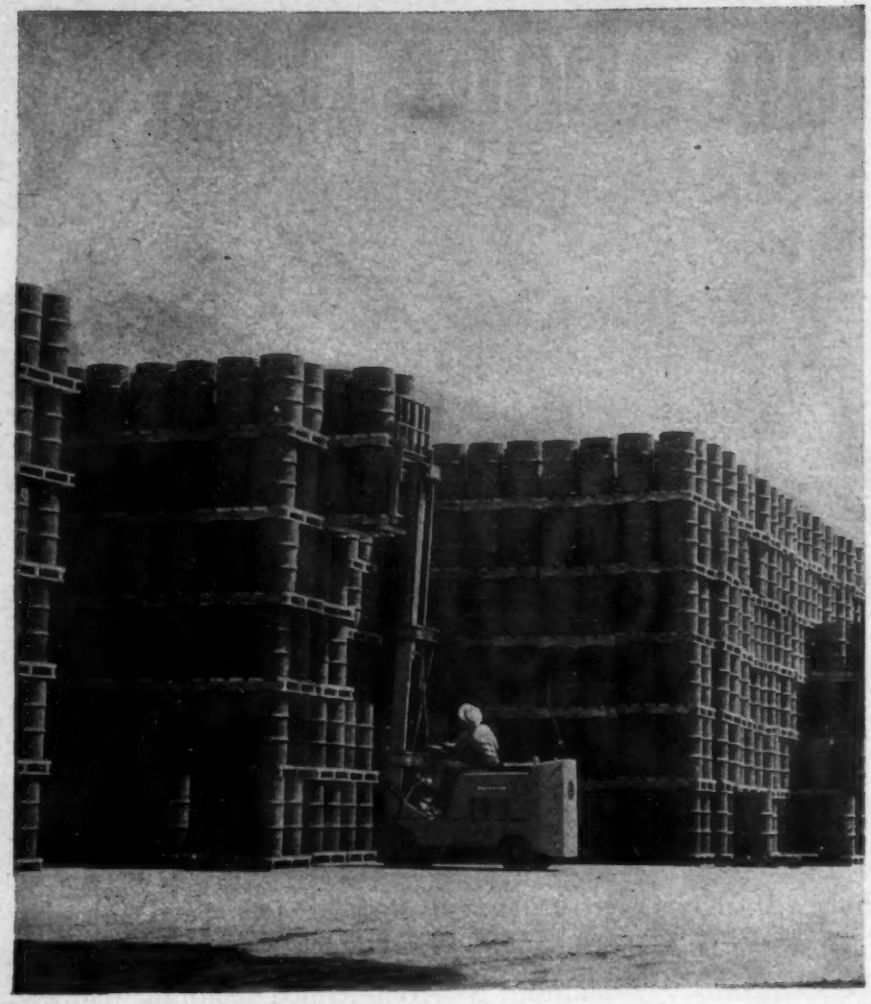

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them from union members, the pickets carried signs charging that the proprietors were "unfair," the food was bad, and customers who patronized the restaurant promoted the cause of Fascism. In denying the injunction, the Supreme Court pointed out that, "to use loose language or undefined slogans that are part of the conventional give-and-take in our economic and political controversies—like 'unfair' or 'fascist'—is not to falsify facts." (Cafeteria Employees Union vs. Angelos)

*Limitation on Judicial Review

The U. S. Supreme Court ruled that designation of bargaining agents and establishment of bargaining units under the Railway Labor Act and jurisdictional disputes between unions are matters beyond the scope of judicial review. If, on the other hand, the court were asked for a decree to enforce a certification by the National Mediation Board or to review a finding of refusal to bargain made by the National Labor Relations Board, review would be allowed. The court could in such a case consider the appropriateness of the unit and the basis of the certification of bargaining representatives, since these issues enter into the question of refusal to bargain. (General Committee of Adjustment for Pacific Lines vs. Southern Pacific Co.; Switchmen's Union of North America vs. National Mediation Board; General Committee Adjustment for M. K. T. R.R. vs. M. K. T. R.R. Co.)

Penalty for Discrimination

An employer who unlawfully discharged his employee may not avoid the back pay due the latter even though he subsequently procured a higher rate of pay. (NLRB vs. Kaplan, CCA2)

*Employee Denied Back Pay for Fraud

NLRB cancelled over $4000 due an employee on back pay because he concealed his interim earnings of $3000. (Remington Rand, Inc.)

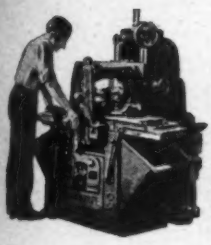
*Fraud Invalidates Majority Status

A union cannot claim to represent a majority of the workers if it procured the right to act as bargaining agent through fraudulent representations. Such misrepresentation invalidated whatever consent the employees might have given. (NLRB vs. Dadourian Export Corporation, CCA 2)

Held Not Interference

An employer placed in a position where, by agreeing or refusing to agree to a contract proposal, he may determine the future status as bargaining agent of the union making the proposal did not violate the Wagner Act. The employer entered into a closed shop contract with an AFL union which exhibited to him a designation signed by 122 of 222 employees, which authorization was to become void at the end of 10 days unless the AFL union secured a certain increase in the rate of

Will your production make this National †† Industrial Par ?



RESEARCH reveals that in the 12 years, 1929-1941, the nation's output per man-hour increased 34%. The rate is 2½% per year compounded. And there is ample evidence accumulating that the rate will advance to at least 4%. War — the supreme national productive effort it calls for — accelerates man-hour output. Improved production techniques — developed in war — carry over into peacetime; the pent-up buying power released after Victory will tremendously stimulate production.

Thus manufacturers who intend to keep step with a high level of national prosperity — the volume production which means more goods for more people at lowest cost, and security of jobs and wages for the greatest number of workers — must strive to increase their output per man-hour 50% every 10 years.

To put it another way, American industry sets a definite national industrial PAR for man-hour output or production — 4% compounded per year rate of increase. The management of your company can determine its own competitive standing in terms of its ability to make or break this PAR.

Every industrial executive knows the key importance of machine tools in reaching production goals. Machine tools were basic to the phenomenal achievement of the American aircraft industry in attaining and surpassing the 60,000 plane quota set at the beginning of the war. The majority of the war industries — all machine tool users — were able to produce at a rate far in advance of the timetables set for them.

Manufacturing for peacetime markets is as much of a challenge as manufacturing for war. To make better products — faster — at lower cost — will call for the newest and finest machine tools — essential implements of production efficiency and the increased output that means security of jobs and wages.

Back the attack **BUY MORE BONDS**

Spotlight facts for your future I.P. *planning*

* Production methods — developed in wartime —increase man-hour output; pent-up buying power — released in peacetime — demands increased production.
* The rate of 2½% increase per year output per man-hour, established by a 12 year record of industrial production, can be expected to reach at least 4% per year — compounded.
* Manufacturers must set a goal of 50% increased output per man-hour every 10 years — to maintain a high level of national prosperity and achieve its benefits in terms of security of jobs and wages for the greatest number of workers and the volume production of more goods for more people at lowest cost.
* Machine tools — the most modern, most efficient — are recognized as the most effective implements of mass production and increased output at lowest cost — but only continual replacements with the newest and finest machine tools assures full productive capacity. *Such replacements yearly should be equal to 10% of the total machine tool investment — in keeping with increased output.*
* The cost of machine tools is insignificant in terms of their productive power . . . from 1927 to 1937, according to census reports, American manufacturers had only a total of about 2% invested yearly in machine tools in ratio to a total volume of 9 billion dollars' worth of production annually.

†† **Industrial Par** — *the constantly increasing output per man-hour equal to approximately 50% every 10 years.*

KEARNEY & TRECKER
CORPORATION
MILWAUKEE 14 WISCONSIN

Milwaukee Machine Too

When Industry Reconverts to Peace, Standard Conveyors Will Be Increasingly Important Production Tools

Today we outstrip the world in military aircraft manufacture. Tomorrow fleets of American-built passenger and freight air liners will be cruising the airways being explored and established now.

The American genius for mass production—with precision and speed — will carry on our war-won supremacy in all production.

Right now Standard Conveyors are helping industry to maintain peak production; conveying equipment will have an increasingly important place in mass production of tomorrow.

Plans for the future anticipate the needs of the aircraft and other progressive industries in the peacetime to come.

Write for bulletin FM-1

•

STANDARD CONVEYOR COMPANY
General Offices:
NORTH ST. PAUL, MINNESOTA
Sales and Service in All Principal Cities

STANDARD
Quality and Power
CONVEYORS

★ ENGINEERED FOR FASTER PRODUCTION ★

pay and other considerations. If it did, the authorization was to remain in full force for one year. The AFL union secured the signatures of 122 employees after rival organizational drives were conducted among employees by it and a CIO union. (NLRB vs. Bradford Machine Tool Company, CCA 6)

*NLRB Order Upheld

The Circuit Court of Appeals ruled that the NLRB has full discretion in determining the effect of prior domination by an employer even though discontinued. Hence the court will not review an order for disestablishment of a new union where there was no outright repudiation of the old union. (NLRB vs. Standard Oil Company, CCA 2)

*Closed Shop Sustained

The Florida Supreme Court dismissed the attack of State's Attorney General on the legality of a closed shop. The state contended that the closed shop is contrary to public policy in that it impedes production on work being performed for the federal government and produces a monopoly of labor in restraint of the right to work. The court concluded that Congress had long sanctioned agreements (with few limitations) by labor unions resulting in monopolies. (Tampa Shipbuilding Company.)

*Union's Untrue Statement Privileged

A California Court ruled that untrue statement (not palpably false beyond possibility of argument) issued by a union newspaper not actuated by malice, did not constitute libel. (Emde vs. San Joaquin County Central Council)

*Union Not Bound by Master Contract

WLB sustained a Regional Board ruling that a local union in one of many company plants need not abide by terms of a master contract applicable to employees in most of the other plants of the company without convincing evidence that the employees involved agreed to be bound by the uniform terms or that working conditions and other factors were the same as obtained in the other plants. (Aluminum Company of America)

Procedural Rules

Under procedure recently announced, the NLB's agent conducting an election will enter on a tally sheet the results of the election, which will immediately be furnished to the parties. The parties are then granted five days within which to file objections. If none is filed, the tally is sent to the National Labor Relations Board with the other records in the case for final decision.

In the case of consent elections, the statement of results by the regional director is final and binding on the parties consenting to the election.

MOVING OIL, GAS OR ACID?

TITEFLEX LASTS LONGER!

Titeflex is the modern engineering answer to industry's need for dependable, economical conveyance of oils, gases, acids, or air.

• Titeflex can stand constant bending—and yet not lose its other important qualities. This extreme flexibility—plus absolute tightness and tremendous durability—is made possible by the exclusive Titeflex convoluted all-metal construction. It withstands constant vibration and wide variations in temperature, and is highly resistant to the corrosive action of most chemicals. These characteristics mean longer life and extra efficiency.

• Design engineers, now planning ahead for post-war production, are invited to consult our research staff regarding the application of Titeflex to any flexible connection problem.

• Write today for a copy of our new 36-page illustrated catalog containing specifications and complete information.

• THE TITEFLEX METAL HOSE CO. •
505 FRELINGHUYSEN AVENUE • NEWARK 5, N. J.

1950 TONS* OF SOOT *Every Month*

1950 tons of soot—is a lot of soot—and our artist figured it would take a lot of smoke stacks, as you can see, to belch out that much every month per square mile area—but actually it does happen during the heating season right in Pittsburg. Baltimore isn't far behind with 1430 tons and so on through the list of all big U. S. industrial centers.

These figures tell a graphic story of atmospheric dust and soot pollution that only adequate air filtration equipment can remedy.

A high percentage of the soot content of the air is removable with mechanical filters—but the finer particles such as smoke for example, and the even finer microscopic dust particles normally invisible, must be electrically precipitated to be arrested.

To meet this need AAF developed the Electro-Matic filter which combines electric precipitation with a self-cleaning air filter. The Electro-Matic is widely used in industry to protect materials in process and whenever a high degree of air cleanliness must be maintained. If you have a spoilage problem due to atmospheric contamination, write for complete information on the American Air Filter line of air filtration and dust control equipment. Bulletins will be sent without obligation.

AMERICAN AAF AIR FILTERS

AMERICAN AIR FILTER COMPANY, INC., 361 CENTRAL AVE, LOUISVILLE, KY.
INCORPORATED
IN CANADA, DARLING BROTHERS, LIMITED, MONTREAL, P. Q.

MUNITIONS

...for Peace

Today's first job is to win the war. Everybody agrees on that, but there is nothing unpatriotic about planning for what is going to happen when the shooting stops.

The ability to produce that is overpowering the enemy with the tools of fighting can begin to make automobiles and refrigerators and radios at remarkable speed — and prevent a long period of unemployment — if we have the plans ready to go on V-day.

Remember that your Acme-Gridley Bar and Chucking Automatics are *adaptable machines*. They turn out identical metal parts, *for all purposes*, quickly and cheaply, maintaining whatever precision standards your work demands.

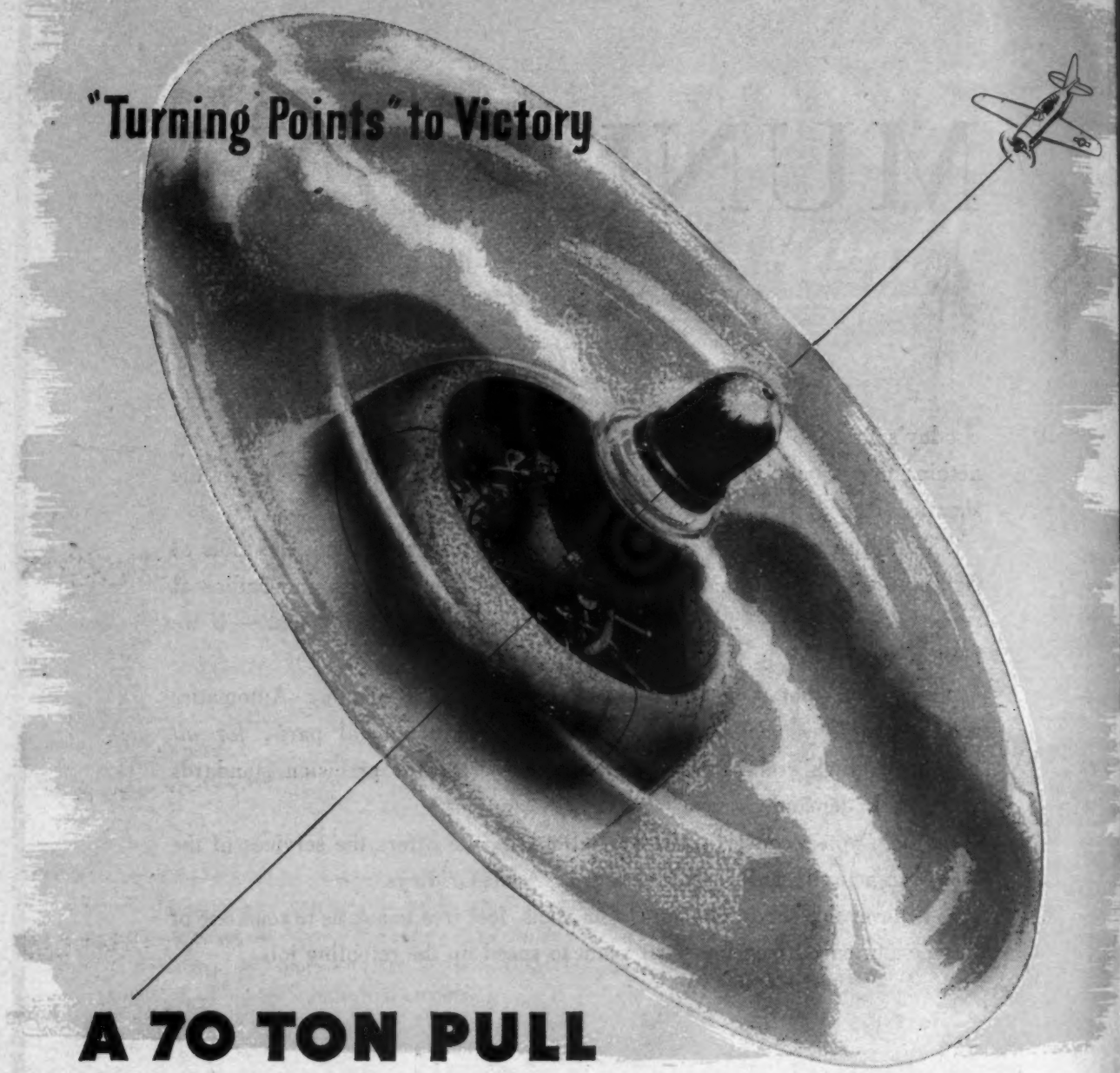
To help you reconvert quickly, National Acme offers the services of the men who actually built and tooled your Acme-Gridleys.

Whenever this service fits into your plans, feel free to ask us to send one of these experienced men into your plant to speed up the retooling job.

ACME-GRIDLEY AUTOMATICS maintain accuracy at the highest spindle speeds and fastest feeds modern cutting tools can withstand.

The NATIONAL ACME *Company*

CLEVELAND · OHIO



A 70 TON PULL

With its 2000 horsepower engine opened up, this 13 foot propellor exerts a pull estimated at 70 tons on the Fafnir blade bearings . . . a vivid example of power and speed carried frictionlessly on ball bearings.

After the heavy raid of the American 8th Air Force on Schweinfurt, center of Germany's ball bearing industry, the official report read in part:

"These Schweinfurt plants turned out a tremendous amount of ball bearings for German war machines.

"All high speed moving parts depend upon ball bearings to eliminate friction. They must have ball bearings to operate war equipment. This attack . . . amputates a huge part of the Nazi's ability to keep moving machinery in operation."

In a mechanized war, friction can be as destructive as enemy bullets. That is why ball bearings are at the "turning points" of practically every piece of fighting equipment.

Millions of Fafnirs are proving their worth in America's fighting machines and in busy industrial machines here at home. Their worth will be just as steadily proved in the machines and vehicles of the peaceful world toward which we fight. The Fafnir Bearing Company, New Britain, Conn.

FAFNIR ARMY E NAVY **BALL BEARINGS**

Functional Fabricators of Sheet Steel Sub-Assemblies

As prime contractors Butler factories turn out a wide variety of lend-lease and war equipment running into millions of dollars annually.

On some of this we let out sub-contracts. For instance, canvas envelopes for suspending under Butler CombatHangars are best made by expert canvas makers.

Butler factories also take a large volume of sub-contracts. Nearly a score of parts for ships are Butler-Built. They range from scuttles and manhole covers to lube oil tanks, deck houses, forecastles, and landing ramp doors. Functional parts for machines, housing for refrigerating units in army food transports and processing tanks for purifiers, which pick up sea or swamp water and make it drinkable... these are a few of the other sub-contract items handled in Butler factories for other manufacturers.

The special skill and high aptitude of Butler engineers and metal craftsmen are deeply rooted in 42 years of multiple-product manufacturing. With the high spirit of a combat battalion, the Butler organization stands ready to contribute even more to America's production miracle through prime contracting as well as give and take sub-contracting.

BUTLER MANUFACTURING COMPANY
KANSAS CITY 3, MO.
GALESBURG, ILL. MINNEAPOLIS 14, MINN.
Sales Offices — Washington, New York, Chicago, Atlanta and Shreveport. Export Office — 8 So. Michigan, Chicago

Manufacturers needing help—send your specifications on any sheet metal functional fabrication to Butler Engineers, Kansas City office.

PRODUCING FOR WAR... PLANNING FOR PEACE

BUTLER BUILT

☆ ☆ ☆ STEEL PRODUCTS ☆ ☆ ☆

STEEL BUILDINGS... TANKS (Storage, Processing and Transport)... FILTERS... STILLS... DRY CLEANING EQUIPMENT
RURAL GAS SYSTEMS... SEPTIC TANKS... GRAIN BINS... FARM EQUIPMENT and PRODUCTS OF OTHER METALS

AVAILABLE
for quick delivery to plants doing war work

Dual Operation of Two Speed Pumps is an outstanding and exclusive feature of 30 ton model.
HEIN-WERNER
HYDRAULIC
JACK 30.11A
30 TONS
HIGH 18⅝

Model 30.11A . . . 30 ton capacity

HEIN-WERNER HYDRAULIC JACKS
are super-powerful and easy-operating

HERE'S WHY H-W HYDRAULIC JACKS *are easier to operate*
In a split-second, mere finger pressure is transformed into a lifting force of several tons

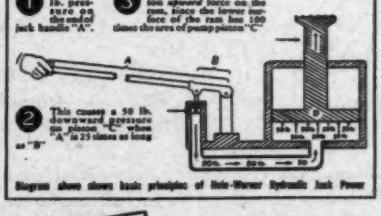


Diagram above shows basic principles of Hein-Werner Hydraulic Jack Power

H-W Jacks are sturdy and compact. For example, Model 30.11A (shown above) packs a "30 ton wallop." It, like the other models in this great line, is great for lifting, lowering, pushing, pressing, and many other industrial applications. Factory tested at 1½ times its rated capacity of 30 tons.

The complete H-W line includes hydraulic jacks of 3, 5, 8, 12, 20 and 30 tons capacity. Ask your industrial supply distributor, or write us for details.

HEIN-WERNER MOTOR PARTS CORP.
Waukesha, Wisconsin

HEIN-WERNER HYDRAULIC JACKS
Are Built Right and Priced Right

Wartime Causes of Low Efficiency

WILLIAM F. TREADWELL, Industrial Engineer, Hammerlund Manufacturing Company, Inc., New York

When the personnel of your plant increases and you get less production and low efficiency from workers, the management's first cry is likely to be: "Call in the standards engineer; our incentive rate structure must be wrong."

Before jumping to that conclusion, every plant manager should make a complete survey of the reasons why he is getting less production with more workers. Let's examine some of those reasons:

1. Conversion

Government contracts have turned many companies into job-order houses when heretofore they were engaged in straight-line production of their regular items. On the job-order plan, operators are shifted from job to job. Many small parts are machined only once in a long period. Assembly workers do a similar type of work on the assembly line, but are never on one job long enough to master it. This gives us our first reason for low efficiency and less production.

2. Turnover of Personnel

Manufacturing under wartime conditions brings about a large turnover of personnel. In many cases the unskilled workers who are being hired in war plants are unsuited for light machine or even assembly line work.

3. Training

Many plants have set up fairly successful training centers. Both old and new employees are trained under expert supervision. But does management realize how much production is being lost during these organized training periods? The old employees are trained for new jobs. They are upgraded. Usually they are the better workers, who have proved their ability at their present jobs. By upgrading them, production is lost on the old job, and it takes these operators several weeks to become efficient on their new assignments. Therefore, average production is lost from both jobs.

4. Timekeeping

Timekeepers are among the lowest paid workers in a plant. Ordinarily, they do not participate in any individual or group bonus. Their work is extremely important because the amount of money a worker receives at the end of a week depends on their accuracy—and errors always creep into clerical work. Workers are many times misinformed as to whether a rate exists or not. Timekeepers must do accurate work.

5. Rates

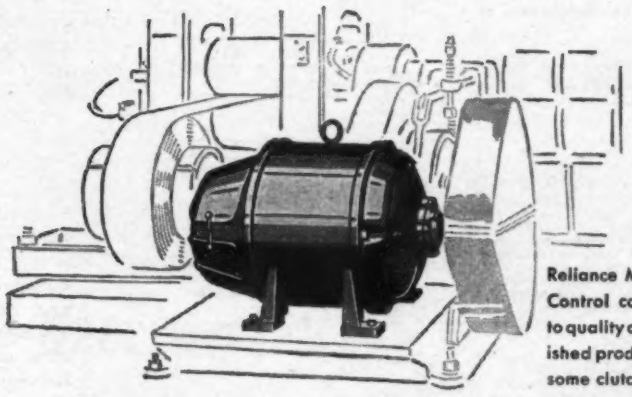
How can incentive rates be controlled under these conditions? In most cases new workers, even after training, cannot run away with the existing rates, which

TENSION!

Tension Control can be an important production factor in the processing of such materials as metals, paper and cloth, which are wound on drums or cores. Tight, evenly-wound rolls and uniformity of the finished product often depend upon it.

All of the characteristics necessary to maintaining proper and constant tension control are inherent in Reliance Electric Motor-Drive.

The pioneering work done by Reliance engineers in putting motor-drive to profitable use along these lines proves again that motor-drive *can* be *more than power.* The results of their experience are available to you at any time.



Reliance Motor-Drive for Tension Control contributes substantially to quality and uniformity of the finished product, eliminates troublesome clutches—and lowers costs.

RELIANCE A·C D·C MOTORS

RELIANCE ELECTRIC & ENGINEERING CO.

1088 Ivanhoe Road • Cleveland, Ohio

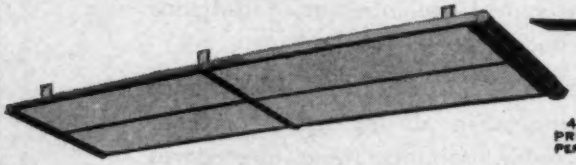
Birmingham • Boston • Buffalo • Chicago • Cincinnati • Detroit • Greenville (S.C.) • Houston • Los Angeles • Minneapolis
New York • Philadelphia • Pittsburgh • Portland (Ore.) • St. Louis • San Francisco • Syracuse • other principal cities.

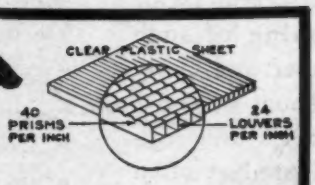
"LOUVERPLAS"
TRADE MARK

Completes the job of fluorescent lighting by CONTROLLING GLARE . . .

Assures maximum manpower efficiency twenty-four hours a day

The only thing fluorescent lighting needed to make it right for the human eye has been proper control. Now this problem has been solved by "LOUVERPLAS", which provides a simple, safe, scientific means of transmitting light to the work area *with all* eye *glare* eliminated.





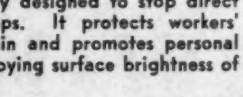
WHAT "LOUVERPLAS" IS

"LOUVERPLAS" is a transparent plastic sheet with louvers and prisms, scientifically designed to stop direct glare from fluorescent lamps. It protects workers' eyes from needless eye strain and promotes personal efficiency by preventing annoying surface brightness of fluorescent lighting units.

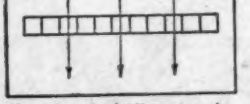
No replacement of fixtures is necessary as a lightweight, safe, and shatterless "LOUVERPLAS" Glare Zone Cover is easily attached to existing industrial reflectors.

"LOUVERPLAS" Glare Zone Covers are available through your local fixture manufacturer, electrical jobber, or direct from us.

Transparent plastic spaces in sheet transmits high intensity light to work area.



Prisms on sheet surface, perpendicular to louvers, redirect the light; through refraction they control the surface brightness, preventing glare.



Plastic louvers closely spaced in sheet diffuse light within glare zone that would otherwise enter the eyes as glare.

IVAN T. JOHNSON COMPANY. INC.
95 MADISON AVE., NEW YORK

SEND FOR SAMPLES

Ivan T. Johnson Co., 95 Madison Ave., N. Y. City

Gentlemen:

Kindly send full information on "LOUVERPLAS" with SAMPLES.

Name ..... Position .....

Company ..... Address .....

were set by previous operators who were time studied on the jobs, because over a period of time the old operators have developed a certain knack. Should management lower the standard rate to the capabilities of the present operators? Certainly not. If this were done, the new worker would have nothing to work for. Don't kick your rate structure around like a football.

6. Delay Time

Have you made a check recently of delay time? Waiting time for work has increased because of new help in the stock control rooms. More time is now taken for set-up of machines and jobs, probably because of the upgrading of the old set-up man to his new position of supervisor or foreman. More machine breakdown time slips in because machines are not being serviced correctly, or replaced. Handling time, the reason most incentive rates are not made, has increased in leaps and bounds because operators are not taught the correct way of doing their job. Delayed time in most plants, if constantly watched, can be cut down more than 50 percent.

7. Materials

Does management realize that raw materials are not as good as before the war? Many times it is necessary to check and inspect every strip of metal in a crate. War contracts have brought closer tolerances and more precise work. Since old machines cannot be replaced, a close watch must be made to keep all machines in good running shape. The engineering department, when it gets behind in issuing blueprints and changes in specifications, causes production difficulties. The inspection department can enlighten you on the difficulties you are having with your subcontractors. You are probably accepting machined work from the vendors that needs a lot of rework in your own shop.

8. Supervision

The main problem for all plant managers in wartime is supervision. Your supervisors need to spend a lot more time instructing the type of worker you are getting in the shop today. Many of these workers are young men and women who have never been in a plant before and consequently do not understand systems, labor unions, and shop rules. Don't let an old employee sour their outlook on the job. Insist that supervisors spend plenty of time with each new employee. This will also aid the man in charge in administering discipline in his department. He should be friendly, but stern. Supervisors should see that the proper job method is followed as set up by the time study and methods analyst.

These are a few of the difficulties you will discover when you take inventory of the reasons why more workers are producing less work. Cost accountants will tell management that labor cost has risen. If you want to have the answer ready, look into these conditions immediately. You may be surprised at what you discover.

WHEN SUB-CONTRACTING DEPENDS ON FINE LIMITS

...y of Vertical ...t Lathes ma... ...g steel crank... ...for Wright ...lone 14 cyl. ...t engine in ... of a subcon... ...r of Wright ...nautical Corp. ...steel forging ...A.M.S. 6382, ...treated to ...ll 241 to 285.

YOU'LL DO WELL WITH "BULLARDS" ON THE JOB

Here is what these V.T.L.s do. Note the close tolerances required.

THE Axis-crushing volume of America's airplane production would not, of course, be possible were it not for widespread sub-contracting. That, in turn, depends upon machines that work rapidly, to fine tolerances you can rely on.

There is scarcely an airplane maker or sub-contractor without its quota of Bullard V.T.L.s. The V.T.L.'s two heads cutting at the same time make for speed; its rigid vertical construction insures accuracy. These same qualities will lower the cost of the varied things we shall need after the war planes have done their job.

- Turn flange, 23" diameter—*limit + or —.001".*
- Turn collar.
- Face flange.
- Bore and chamfer flange I.D.
- Form 19" counterbore, depth ¼"—*limit + or —.001".*
- Turn O.D. of central boss—*limit + or —.002".*
- Bore boss—*limit + or —.0005".*

THE BULLARD COMPANY

BRIDGEPORT 2, CONNECTICUT

The Kellogg Division

of

American Brake Shoe Company

announces the purchase of

Crown Spray Gun Manufacturing Company

Kellogg Division of American Brake Shoe Company has acquired the Crown Spray Gun Manufacturing Company of Los Angeles, California.

This adds to the Kellogg-American line of air compressors a complete range of spray equipment including guns, booths, exhaust fans and paint containers.

Kellogg also makes car lifts and high-speed car washers. With the purchase of Crown's production and research facilities, service in the fields where Kellogg-American is widely known and used will be expanded.

Products of the Crown plant, which will continue to be made at Los Angeles, will be distributed in the future under the name Kellogg-Crown. Each plant will benefit from the research and engineering divisions of both organizations, and from that of the American Brake Shoe group of technologists at Mahwah, New Jersey.

Kellogg Crown products and parts are available at

Crown Spray Gun Manufacturing Company, Los Angeles, California
Kellogg Division, Rochester, New York

AMERICAN BRAKE SHOE COMPANY, 230 PARK AVE., NEW YORK 17, N. Y.

8 DIVISIONS, 59 PLANTS SERVING INDUSTRY AND TRANSPORTATION

American Brakeblok Division ..... Detroit, Mich.	Kellogg Division ..... Rochester, N. Y.
Ramapo Ajax Division ..... New York City	American Forge Division ..... Chicago, Ill.
American Manganese Steel Division . Chicago Heights, Ill.	Southern Wheel Division ..... New York City
Brake Shoe and Castings Division ..... New York City	National Bearing Metals Corp. ..... St. Louis, Mo.

NORTON *Diamond Wheels*
HELP SINK ENEMY SHIPS

Diamond Wheels Have Put Optical Glass on a Mass Production Basis

The war's sudden demand for thousands upon thousands of lenses and prisms for binoculars, range finders, periscopes and other instruments literally swamped former methods of producing these optical products. The answer—Norton Diamond Wheels now grinding glass in high production, both in roughing operations and to a transparent finish.

In countless applications Norton Diamond Grinding Wheels are meeting the challenge of war.

•

Norton Company, Worcester 6, Mass.

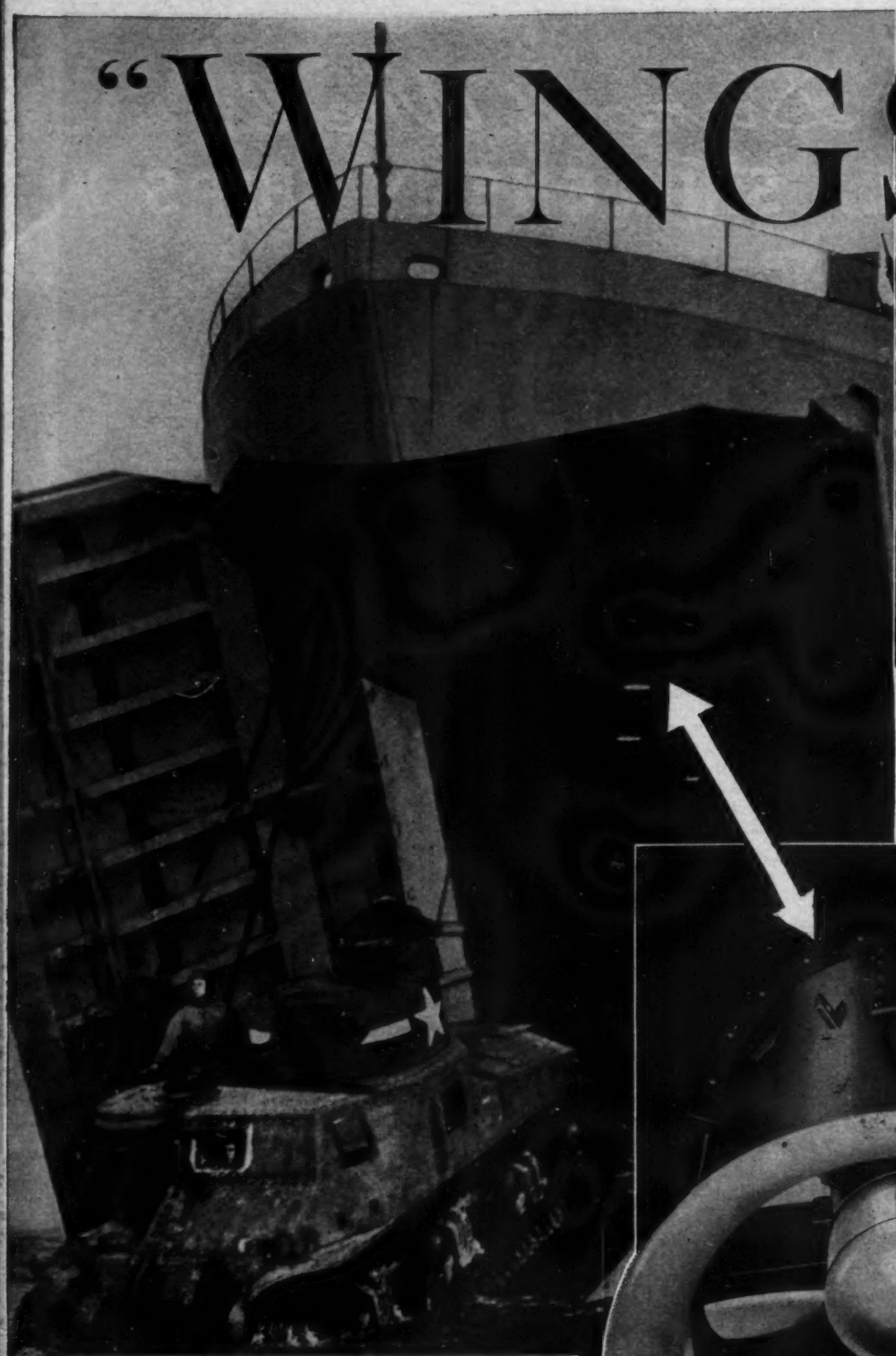
Behr-Manning, Troy, N. Y., is a Norton Division

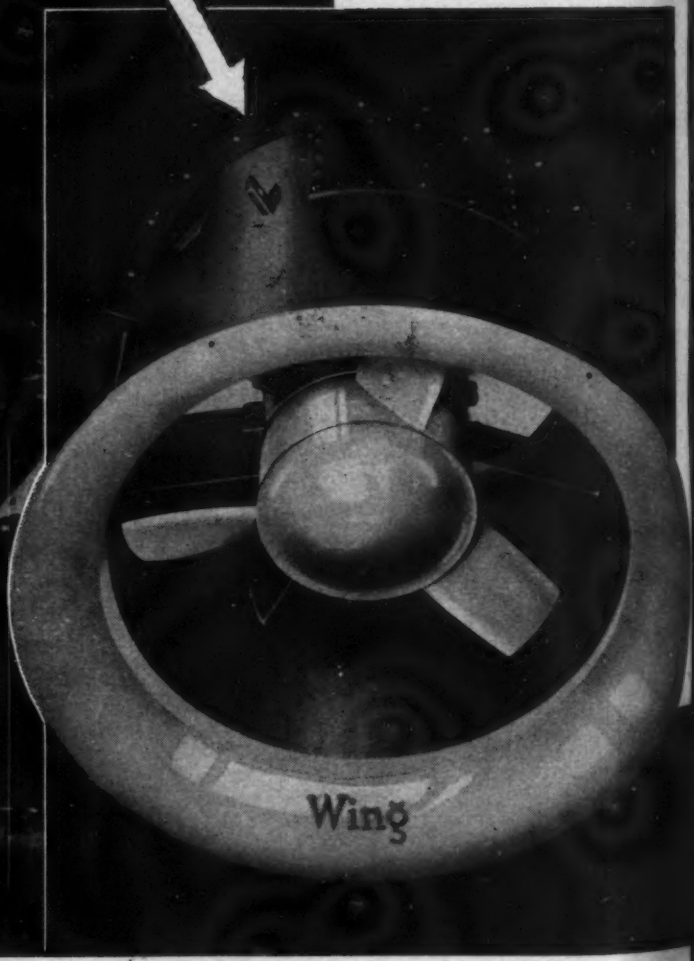
NORTON ABRASIVES

"WINGS" fo

OFFICIAL U. S. NAVY PHOTOGRAPH

262,500,00 FM
BY 750 ING





"The inside of the tank decks of one of the LST's has the appearance of a gigantic garage, and, in fact, that is what it is. In the vast space there is row upon row of tanks, trucks and jeeps.

"These LST ships do not dock—they simply drive on to the beach until they ca[illegible] the ground. Once beached, the ship has to stay there until all the cargo has roared its way ashore. Sometimes the work has to go on all night. Outside everything will be blacked out, while inside is a blaze of light, with the sound of engines starting up, the hum of the lift and the banging of caterpillar treads—and the traffic lights are shining from red to amber and amber to green. The deep hum of the exhaust fans can be heard as thousands of cubic feet of foul fumes are sucked out into the air. If those fans ever stopped, the soldiers working below would be dead in a few minutes."

FM AT 1 INCH STATIC PRESSURE DISCHARGED
ING AXIAL FLOW BLOWERS ON LST SHIPS

The first "cargo" discharged by the famous LST landing ships is the volume of deadly exhaust fumes given off by the tanks warming up below decks prior to the invasion landing. These fumes are exhausted through a large number of Wing Axial Flow Blowers each delivering 35,000 CFM at 1 inch static pressure. The "cargo" which follows is the world's most powerful armored corps—tanks, trucks, jeeps, motorized artillery — the vanguard of invasion blasting the way to Victory.

These LST's have made possible our successful landings in Tunisia, Sicily, the Italian Mainland, the Solomons, the Aleutians, and will undoubtedly be in the fore of the Invasion of the Mainland of Europe.

Wing is proud of the fact that its years of pioneering in the ventilation field have thus been climaxed by one of the most important ventilation projects of our time.

L. J. Wing Mfg. Co.

162 W. 14th Street · New York 11, N. Y.

Factories: Newark, N. J. and Montreal, Canada

WING AXIAL FLOW BLOWERS

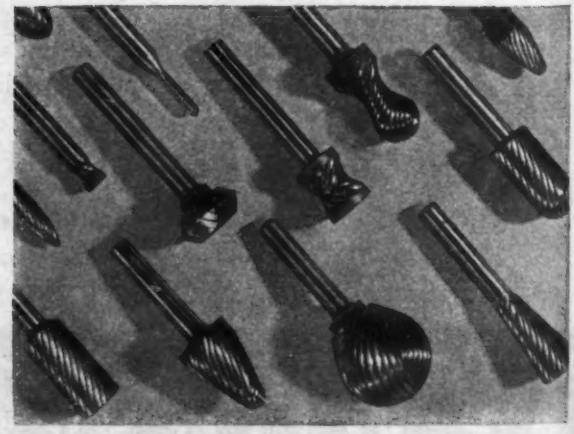
SEVERANCE DISC CUTTERS SPEED FINISHING OF PLASTICS

When it comes to finishing moulded plastic parts, you can't beat Severance Cutters. One efficient installation is shown here. A Severance rotary disc cutter mounted on a spindle with an adjustable table allows perfect finishing of the rough edges with amazing speed.

Severance disc cutters are made of High Speed Steel, in a wide range of sizes. Their teeth are cut in a staggered pattern which produces a shearing cut and thus eliminates chatter.

If you are having difficulty in finishing any manufactured parts, send us samples and our Engineers will design cutters to solve your problems.

Severance complete line of "Carbide" Midget Milling Cutters are now available.

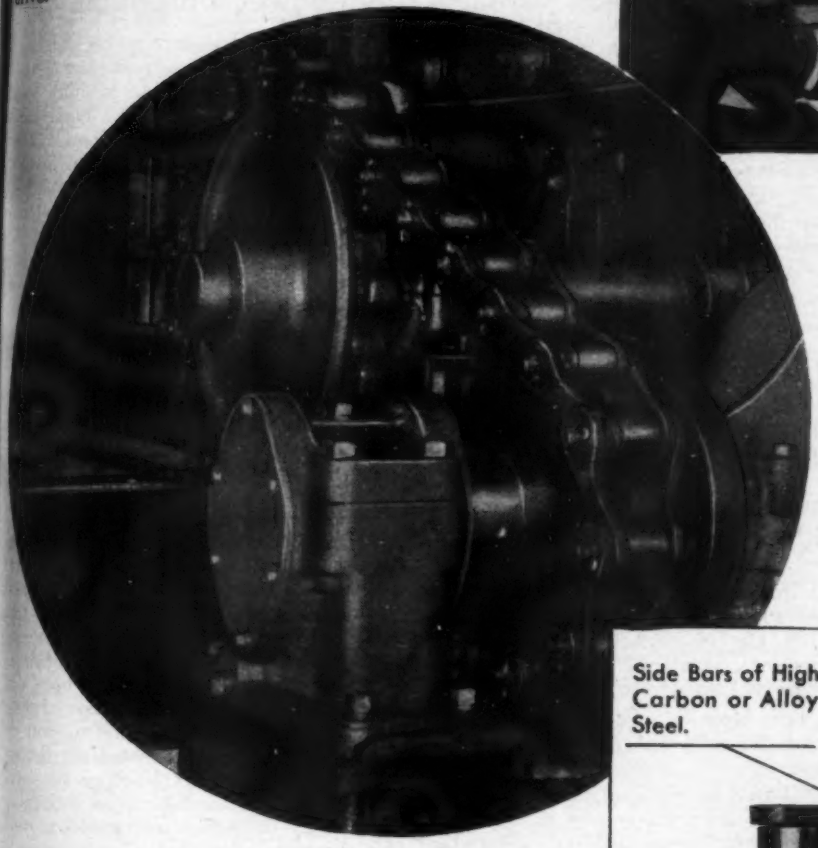


Severance

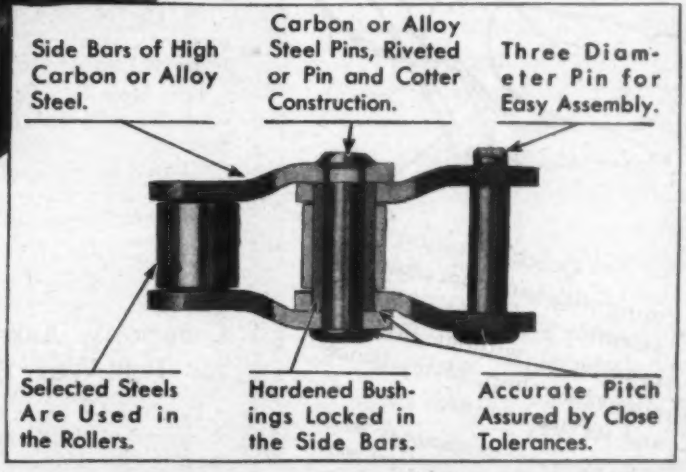
SEVERANCE TOOL INDUSTRIES INC., SAGINAW, MICHIGAN.
PLANTS IN LONG ISLAND CITY, N. Y.; DETROIT, MICH.; FORT WAYNE, IND.; CHICAGO, ILL. AND LOS ANGELES, CAL.

WE CALL THAT OUR PLEASURE DRIVE

❶ **"I STILL HAVE THE JITTERS** when I think of that old drive we had," this plant engineer told me. "Always breaking down right in the middle of a big rush job . . . never really operating right, it was the headache of the whole shop. We never got real production till we decided to put in that Chabelco chain belt drive."



❷ **"DID IT EVER FILL THE BILL!** Why, that chain belt runs so smoothly the boys call it the 'pleasure drive.' And it not only operates better, but it has lasted far longer. Let me tell you, with the conditions under which it operates . . . dusty, dirty, never getting the right attention or lubrication . . . it's a miracle it runs at all. How come that Chabelco chain drive is so good?"


Side Bars of High Carbon or Alloy Steel.
Carbon or Alloy Steel Pins, Riveted or Pin and Cotter Construction.
Three Diameter Pin for Easy Assembly.
Selected Steels Are Used in the Rollers.
Hardened Bushings Locked in the Side Bars.
Accurate Pitch Assured by Close Tolerances.

❸ **"LOOK AT THIS DIAGRAM,"** I told him. "Look at that three-diameter pin with its milled ends that prevent it from turning in the side bars. Note the offset side bar construction, the high finished, case hardened bushings locked in the side bars and the other quality Rex features. It's built tough for tough service. That Rex design means far longer life and greater service."

* * *

Rex Chabelco chain belts are the answer to any drive problem where strength and long life is needed. The Rex man can help you with your chain belt application problems. And for engineering data on Rex chain belts, ask for the 768-page catalog No. 444. Chain Belt Company, 1667 W. Bruce Street, Milwaukee 4, Wisconsin.

REX CHAIN BELTS

More than 2000 sizes and types for the positive transmission of power, timing of operations and conveying of materials.

CHAIN BELT COMPANY OF MILWAUKEE

Rex Conveying and Engineering Products Division, Rex Chain Belt and Transmission Division, Milwaukee, Wis. · Baldwin-Duckworth Chain Belt Division, Springfield, Mass.; Worcester, Mass.

designed for time saving

Quick-precision shimming with Laminum often cuts assembly time 20 to 30%. Is introduced without fuss ... also eases shop, maintenance and service routine.

Shims cut to your specifications. Stock shim materials obtainable from your dealer. Write us for further information and shim application chart.

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Incorporated
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LAMINUM
THE SOLID SHIM THAT peels FOR ADJUSTMENT
2044

THEY SAY AND DO

Pledge for Production Employees

The following pledge was adapted by Roland G. Hartwell, apprentice supervisor, Farrel-Birmingham Company, in answer to, and based on, "Two Pledges for Foremen," by A. L. Kress, FACTORY, May, 1943.

"To promote cooperation, good will, mutual understanding, increased production, and quality, in all my relations with my associates and with those above me who are dependent on me for results, I pledge myself to:

"1. Carry out all company policies and procedures to the best of my ability and to make my suggestions constructive—never destructive.

"2. Know my work better from day to day through experience, observation, and study.

"3. Be constantly alert to keep my production up to quality standards and my mind open to improved methods.

"4. Be helpful to others, stand on my own feet, and never pass the buck.

"5. Be attentive to instructions and carry them out skillfully, and with a definite degree of common sense and honesty.

"6. Develop safe habits, and sell safety to my shop mates at all times.

"7. Expect the best from my foreman and give him my best in return.

"8. Never promise things I can't deliver, promote cleanliness, and avoid waste.

"9. Get all the facts before I act—not jump at conclusions, and treat the other fellow as I should like to be treated.

"10. Meet each day's work and problems cheerfully, with patience, persistence, reasonableness, and understanding.

"To do these things that I may merit the confidence and respect of those who have entrusted me with my responsibilities."

•

Company Asks Workers for Post-War Suggestions

Planning for the future, for post-war prosperity, is taking a major share of management's thinking these days, now that victory seems assured.

In an effort to be assured that all the constructive thinking on this subject is available for use, the Lincoln Electric Company, Cleveland, has inaugurated a "Post-War Planning Competition for Lincoln Employees." The subjects to be covered in suggestions are (1) post-war products which the company is in position to build and which are along the line of its present endeavor and on which its present experience will be of benefit; (2) methods of manufacturing such post-war products suggested or a method of manufacturing its present products. All Lincoln employees who are working at the time the paper or suggestion is submitted are eligible.

It is emphasized in the folder setting forth the rules of the contest that this contest does not interfere with the regular suggestion system.

•

Incentives Play Part in Manpower Utilization

America's war production could be increased as much as 35 percent through the best utilization of existing facilities and labor, according to John W. Nickerson, director of the War Production Board Management Consultant Division. Speaking at a meeting of the American Management Association, Nickerson pointed out that a good share of this potential increase in production can be secured through sound wage incentive plans.

"Generally," he said, "incentives applied to individuals and small groups are more responsive than those applied to large groups within a plant . . . It is often felt desirable to include indirect workers in an incentive plan even when the direct measurement of their production is impracticable, but in such cases some relationship to the measured unit must be carefully and clearly established.

"There has been considerable written and said in recent months on the subject of plantwide incentives. There are plants today where it is impracticable from the point of view of time to wait for scientifically established individual standards. In many such cases, plans have been devised which will prove effective during the war. With the enthusiastic support of management and labor, standards for an entire plant may be set, based on the total production per man-hour, and incentives paid to all employees as a proper reward for the extra effort and accomplishment.

"The engineers of the Management Consultant Division have been working with the Regional War Labor Boards for over six months, evaluating incentive proposals submitted to those boards with respect to their probable effect upon costs, wages, and production. Currently we are analyzing the different types of plans, feeling that such analyses will indicate trends both as to type and design of incentive plans.

"The figures I am using today are based upon a survey of 50 cases studied by members of the Division, which were subsequently approved by the New York Regional War Labor Board.

"The total number of employees covered by the 50 cases was 14,875. Individual cases ranged from as few as 6 employees to as many as 3000; by far the greatest number falling into the 50 to 250 group.

"Each plan was analyzed to determine whether the standards as set represented

CHOOSE THE BELT
THAT BEST FITS
THE NEED

HOUGHTON OFFERS 3 TYPES -ALL LEATHER - ALL TREADED!

VIM TRED-OAK LEATHER BELTING

Here is the best belt for shifting drives, flange or step-cone pulleys — a two-ply leather belt with VIM Tred on the pulley side, slightly undercut in width, and cemented firmly to a stiffer oak. The oak is firmer, to stand up under edge strain; the VIM Tred has a higher C/F, grips better, slips less. Thus this belt cannot climb pulleys, or become crooked or worn on the edges.

VIM TRED LEATHER BELTING

VIM Tred is "tops" in transmission belting for the great majority of plant drives because (1) it has higher coefficient of friction, minimizing slippage. (2) It is treaded, an exclusive Houghton patent resulting in increased pulley contact pressure. (3) It is soft and flexible, yet tough and strong—hugs the pulley at all speeds. (4) Withstands higher temperatures. (5) Runs smoothly, without vibration.

Choose VIM Tred, and you choose the best in power transmission belting!

E. F. HOUGHTON & CO.
PHILADELPHIA
CHICAGO · SAN FRANCISCO · DETROIT

OKAY TRED LEATHER BELTING

Better than first-grade oak, OKAY Tred is offered for types of drives where highest gripping qualities may not be desirable, such as under pulsating and variable loads. This belt is the result of a combination tannage which provides high C/F and tensile strength. It is more pliable than oak, costs no more, has a softer grain and is given the same pulley - gripping tread as is our VIM Tred.

Houghton's TREADED LEATHER BELTING

Silv-A-King "RLM" Standard Dome Reflectors

Silv-A-King "Victory" Fluorescent Units

LIGHTING EQUIPMENT

For Industrial Needs

In spite of the heavy demands of war production, Silv-A-King—specialist in industrial lighting for close to a quarter-century—is regularly filling priority orders for both fluorescent and incandescent lighting equipment. Silv-A-King lighting units offer many advantages in over-all efficiency, easy installation and maintenance—and all equipment conforms to RLM and other recognized standards for high quality and efficiency.

Silv-A-King lighting service—which costs nothing extra—includes expert guidance in planning lighting layouts for maximum efficiency, flexibility, and economy. Why not discuss your lighting problems with a Silv-A-King engineer? *And send for the complete Silv-A-King catalog today!*

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SILV-A-KING MAKES *Light* WORK FOR YOU

the productive effort of an individual, a group of employees within one department, or all of the employees of the plant; also whether it concerned a group of indirect employees only. The following figures were arrived at: Individual, 56 percent; group, 26 percent; plantwide, 14 percent; indirect employees only, 4 percent.

"These figures indicate that there is a trend toward plantwide plans. This type of plan was not confined to multi-operation plants, where it is generally a difficult and lengthy task to develop operational standards. In several cases, only a few employees and a small number of operations used the plantwide plan.

How Standards Were Set

"Each case was studied with regard to the manner in which the production standards were developed—whether by actual time study of each operation, by a compilation of past performance as measured in units of production, or by establishing a ratio of labor cost to volume of sales—with the following results: Time study, 44 percent; past performance of production, 50 percent; ratio of labor to sales volume, 6 percent.

"Perhaps the most interesting trend developed was that of using means other than time study to develop production standards. It is our feeling that incentive plans in which the standard is based in any manner on sales volume should be viewed with much caution, although there may be some instances where production is critically needed and where the relationship between effort and a measure of sales volume shows a close correlation.

"We also determined the relation between the standards and past performance. By this is meant a determination of where the standard is set in relation to past performance, and is a measure of the extent to which production must be increased before incentive payments would be made to employees. In other words, it is the margin between past performance and the amount of production required to equal standard, and is expressed as percent of increase in production at standard. The following figures indicate the results: Time study, 20.3 percent; past production performance, 5 percent; ratio of labor of sales volume, 18 percent.

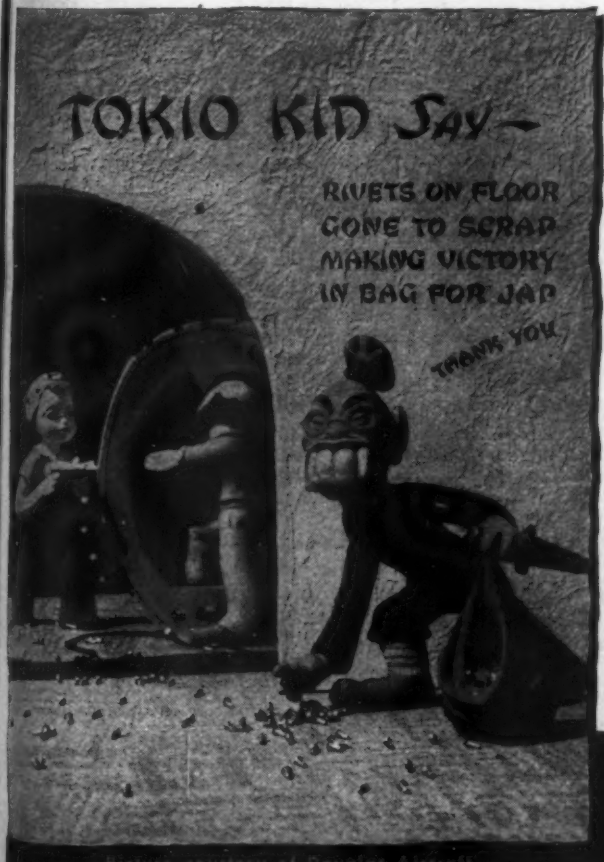
These figures are interesting in that standards developed from time studies were set considerably in excess of previous production. The average increase in production required to meet the standard in these cases averaged 20.3 percent. On the other hand, standards developed from past performance were, in general, set exactly at that figure or slightly in excess of it. In the case of those companies using a ratio of labor cost to sales volume, apparently a realization of some of the variables left uncontrolled prompted the setting of the actual ratios about 18 percent above previously attained performance.

The division of savings resulting from production in excess of the standard is expressed as the percent of increased earnings to increased production above standard, and range all the way from 10 to 100 percent: Time study, 86.5 percent of the

Ready for Quick Delivery!

NEW, IMPROVED

CLECO RIV-N-JECTORS



Picture courtesy of Douglas Aircraft

They reduce rivet dropping 90% or more. The Cleco RIV-N-JECTOR is a feather-light device comprising a magazine which holds 50-odd rivets—depending on length—combined with a mechanism by which rivets may be inserted in the hole and released, another rivet at the same instant being moved into position for inserting in the next hole. RIV-N-JECTORS are loaded by use of the electrically operated hopper illustrated.

RIV-N-JECTORS are made in three sizes: No. 1 for 1/16" and 3/32" rivets; No. 2 for 1/8", and some types of 3/32"; No. 3 for 5/32" rivets. All RIV-N-JECTORS carry lettered panels to show size, and are further identified by color bands corresponding to colors used for Cleco Sheetholders.

The whole story of RIV-N-JECTORS and loading hoppers is told in new Bulletin 89, sent upon request. Demonstration at your convenience—entirely without obligation, of course.

THE CLEVELAND PNEUMATIC TOOL CO.
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SPECIAL BOLTS AND STUDS

Uniform in strength, with precise, clean cut threads, and forged heads of any type or shape, RITCO Special Bolts and Studs can be made in any metal . . . ground or unground . . . in sizes up to 2" diameter. We are regularly supplying special bolts to fill the needs of the aircraft, marine, automotive and many other industries.

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RHODE ISLAND TOOL CO.
148 West River St., Providence, R. I.

Serving American Industry Since 1834

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cases provided 100 percent; past performance, 45.8; sales volume, 33.3.

These figures show that the split of savings above the established standard followed a well-developed pattern. As would be expected, in the majority of cases using standards developed from time studies, 100 percent of the savings were paid to employees as earnings. In cases when standards of past performance or sales volume were used as standards the percent of cases providing 100 percent of savings paid to employees was much less . . .

"Although it is true that about one-half of these incentive cases in the New York area used standards based upon past performance instead of upon scientifically determined facts, still we may be assured of no increase in unit labor cost. Clearly there are occurring heavy increases in the production of vital war material which would otherwise have been delayed."

•

Why Pick on Foremen?

GILBERT LINDGREN, Electrical Foreman, Hudson Valley Fuel Corporation, Troy, N. Y.

A national publication has conducted a poll among war workers to find the answer to "What's Wrong With Management." Thousands of answers, they tell us, have revealed the fact "that the greatest source of friction, inefficiency, waste, and bad feeling is the lack of capable foremen."

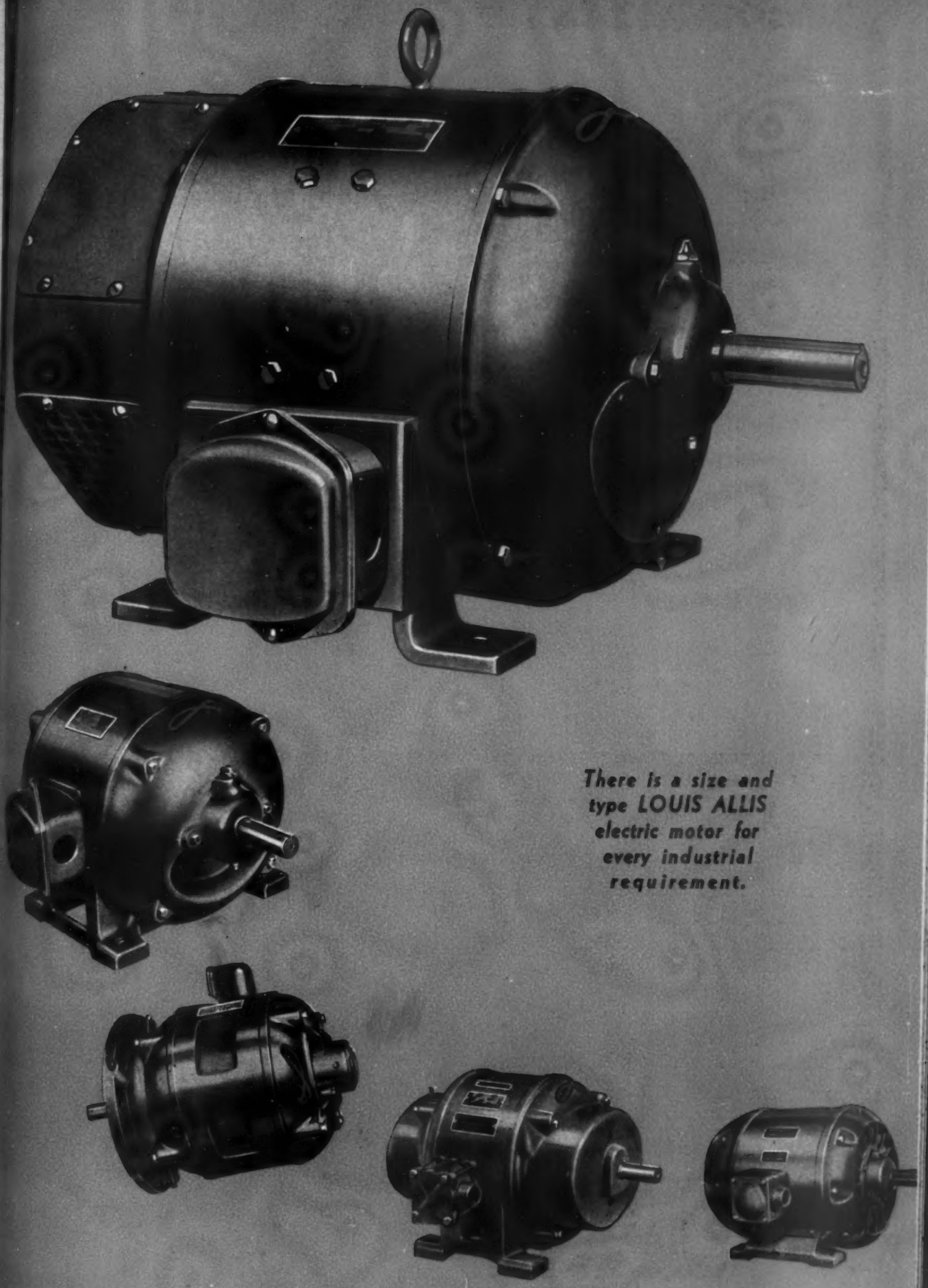
Why single out the foremen? There has always been a lack of capable men, not only foremen. All our ills, or at least 99 percent of them, whether industrial, political, or social, are due to a lack of capable leaders or directors.

I have been a foreman for the past 30 years, in four different industries, with five different employers. I have, during this time, made a few observations regarding the job of a foreman. First of all, the foreman dares not adjust himself to either the frying pan or the fire. He must tread carefully around the thin edge of the skillet. To go either way will spell his doom.

The foreman's particular job is to try and mold into a workable puddle two factions whose basic efforts are exactly opposite. Those in the frying pan are trying their damnedest to get all the money they can for the least amount of effort. Those on the fire are trying equally hard to get all the effort they can for the least amount of money.

Between these two rival factions the foreman must act as a cushion. He must see to it that those under him get all the favorable items to which they are entitled. He must, at the same time and place, see to it that those above him get all the favorable items to which they are entitled. If the foreman finds himself in an organization where these two parties have worked out a fair understanding, he is fortunate indeed. If not, he may possess all the virtues of a saint, yet fail to register with either of the parties as a capable foreman.

Sure, the foreman makes mistakes,



There is a size and type **LOUIS ALLIS** *electric motor for every industrial requirement.*

THE LOUIS ALLIS CO., MILWAUKEE 7, WIS.

Take Motors for Instance—

We are reading a lot these days about the miracle of RADAR — how it is helping our boys WIN this war — sinking Jap ships eight miles away in pitch darkness — blasting enemy planes out of the air —

When Radar was taken out of its swaddling clothes and sent to war — the Army turned to Louis Allis for dependable electric muscles to power these miracle units —

It was a Louis Allis powered Radar unit that first detected the approach of planes at Pearl Harbor.

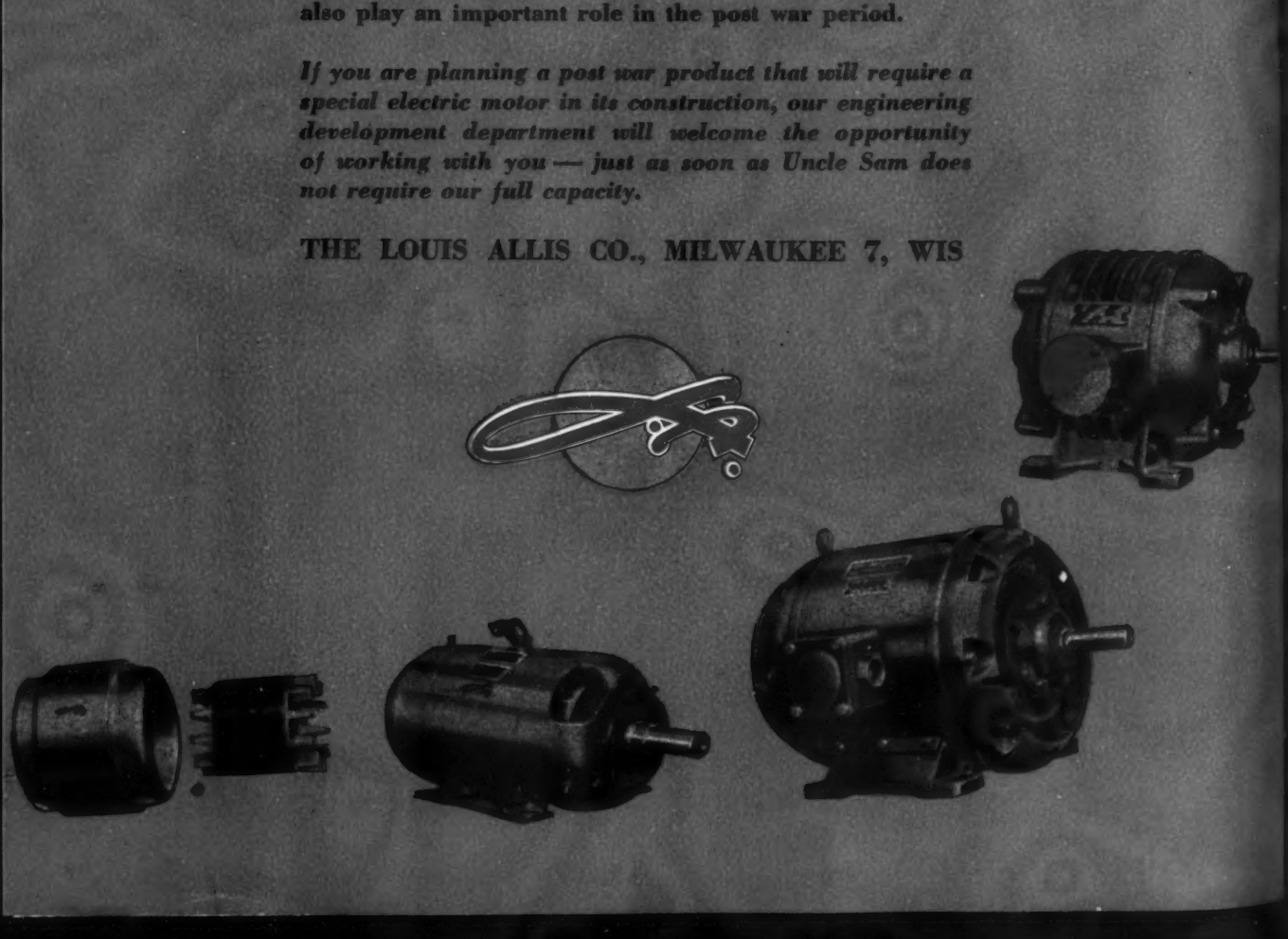
The U. S. ship that blasted thirty-two attacking Jap planes from the sky in less than that many minutes did it with the aid of Louis Allis powered Radar controlled guns.

Our engineering development department has created many outstanding — if not revolutionary — improvements in electric motor design — construction and performance — as our share in helping win this war as quickly as possible.

Many of these important new motor developments will also play an important role in the post war period.

If you are planning a post war product that will require a special electric motor in its construction, our engineering development department will welcome the opportunity of working with you — just as soon as Uncle Sam does not require our full capacity.

THE LOUIS ALLIS CO., MILWAUKEE 7, WIS



plenty of them. But don't forget this—95 percent of all the foreman's actions are based on his expected reactions from those above him and from those under him. Not more than 5 percent of his time is spent in carrying out his own personal ideas or opinions; his personal feelings in any matter must be secondary.

Perhaps some day we shall have capable foremen. But first of all we must have capable men in the ranks. Where else will capable foremen grow? Next we must have capable men at the top. Who else will be able to select the right men from the ranks?

•

Production for Victory

(The war and post-war program of American industry as stated in the 1944 platform adopted by the National Association of Manufacturers at its recent Second War Congress of American Industry, held in New York, plus excerpts from many of the speeches presented at the Congress, follows:)

This is the pledge of American industry:

PRODUCTION FOR VICTORY

That this pledge is good is proved by the record.

Victory will be won! Even though the road ahead may be hard and long, this is no longer open to question.

So American industry—producing for victory—looks to the future.

Out of this looking forward has come a program—a program for a better America—one on which all citizens can unite.

The program of American industry is designed to provide

OPPORTUNITY—JOBS—FREEDOM

so that men and women all over America may attain higher standards of living and sound economic security in a land that is free.

Opportunity. Jobs. Freedom. These are the post-war goals of American industry. Indeed, of all America.

How may these goals be won? By holding to sound principles—to the principles of the Declaration of Independence and of the Constitution with its Bill of Rights.

But that is not enough. Hard work must be added. And goods and services must be produced and distributed.

Production and distribution. These are the elements of doing business. And by doing business opportunities and jobs are created. Then come greater opportunities and more jobs. For opportunities and jobs beget each other.

Basis of American Way

But no opportunity is good and no job worth while without freedom. Freedom is the very basis of the American way of living, of working, of doing business. And doing business in the American way means free, private, competitive enterprise, by whatever name it is called.

Enterprise that is "free" calls for the highest degree of personal freedom attainable under just laws impartially enforced. With each individual free to save and invest in his own shop or farm or in a company owned by many shareholders. And no arbitrary control by government.

Enterprise that is "private" calls for the

How Steel got fighting mad!

The back-of-the-lines story of a basic industry at war is told in an exciting motion picture . .

"TO EACH OTHER"

THIS PICTURE takes you on a tour of steel plants all over the country. Shows old and new mills rushed into service to meet the terrific demand for steel. Singles out improved processes of steel-making inspired by war needs.

Scenes for this action-packed picture were photographed against a background of flaming furnaces, thundering mills and giant shipyards. The workers shown are men and women playing their real-life roles. As the picture unfolds, the story of "To Each Other" is told by a famous Hollywood character actor—a story of fathers and brothers, of wives and sisters, and the steel they make for fighting weapons to back up their fighting men.

You'll see them spin a big steel tube into a bomb—and do it ten times faster than ever before. You'll watch the fashioning of intricate springs that make a machine gun chatter. You'll be fascinated by the sight of great ships fabricated on a production line. You'll see four great destroyers launched at one time from a single shipyard!

Available for Group Showing . . . at No Charge

More than a hundred war-born miracles of steel make "To Each Other" a picture of thrilling entertainment—as well as an important part of the education of everyone who cares about winning the war.

This 35-minute film will be loaned at no charge, for showing before employee groups, clubs, or any professional civic or fraternal organization. Why not suggest that your program committee arrange to show this picture! Send the coupon below for application blank and illustrated folder.

United States Steel FM
Room 1650, 436 Seventh Avenue
Pittsburgh 30, Penna.

Please send, at no obligation, illustrated folder describing new 35-minute motion picture, "To Each Other"; also application blank with which to order this free film.

Name.....

Organization.....

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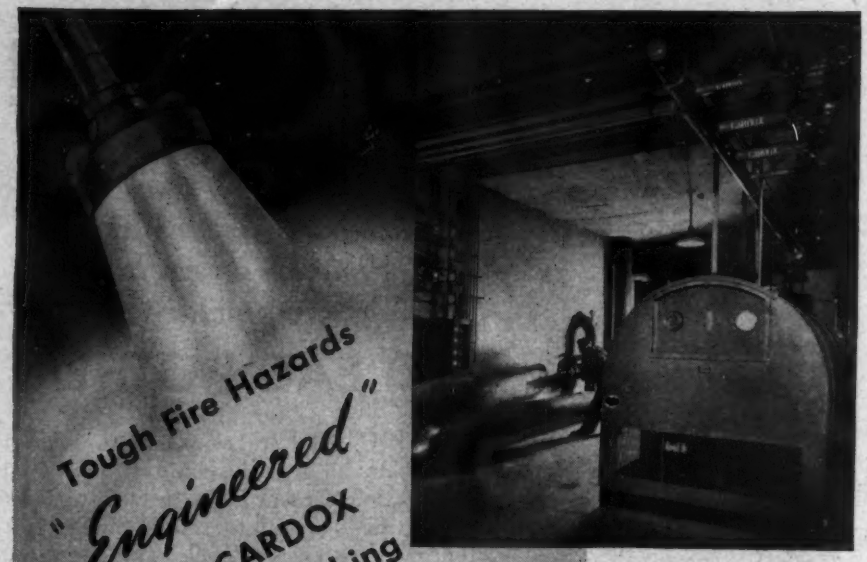
City..... State.....

UNITED STATES STEEL



Tough Fire Hazards "Engineered" this CARDOX Fire Extinguishing System

This view of a part of a Cardox System shows a 10-ton Cardox Storage Unit in which carbon dioxide is maintained at a standard storage temperature of 0°F.

Hazards in this plant involve the extensive use of flashy flammable liquids. Unless extinguished in a few seconds, fire could mean the total loss of precious materials and skilled man-hours.

Protection for these hazards is provided by a Cardox System . . . individually engineered to give the most effective application of Cardox CO_2 for the specific hazards protected by the system.

How This Cardox System Performs

Fire in any of these hazards is detected visually or automatically.

An alarm sounds, giving personnel notice to leave the fire zone. Time is allowed for complete evacuation of personnel.

A timed, *mass* discharge of cold Cardox CO_2, released into the fire zone, reduces oxygen content of the atmosphere below combustion requirements and cools out the entire fire. So rapidly is the Cardox CO_2 discharged into the fire that burning time is usually cut to a very few seconds.

Since Cardox CO_2 is a non-damaging, non-contaminating inert gas, there is no damage or production delay caused by the extinguishing medium.

How Cardox Systems Provide Uniform Performance

Extinguishment of this kind is possible with a Cardox System, through engineered application of carbon dioxide maintained at a standard storage temperature of 0°F. Cardox CO_2 extinguishing performance is uniform, regardless of weather or plant operating temperature.

The advantage of uniform extinguishing performance can thus be provided in small or large systems, whether engineered for one or a number of hazards —indoors or out.

Convenient hose reels can be included in the system for fire that would call for local direct application of Cardox CO_2. For example, loading or unloading volatile and flammable liquids.

If you would like more information to help solve war plant fire protection problems of today . . . or in perfecting post-war plans for reducing loss of property and life by fire—write for Bulletin 1114.

★ ★ ★

CARDOX CORPORATION

BELL BUILDING • CHICAGO 1, ILLINOIS

District Offices in New York • Washington Detroit • Cleveland • Atlanta • Pittsburgh San Francisco • Los Angeles • Seattle

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MASS DISCHARGE OF CO2 · ENHANCED COOLING EFFECT · CENTRAL STORAGE UNIT · AMPLE CO2 RESERVE · ENGINEERED SYSTEMS · MANUAL OR AUTOMATIC CONTROL

CARDOX

NON-DAMAGING FIRE EXTINGUISHING SYSTEMS

preservation of property rights, the priceless heritage of American citizens. This means private ownership—not government ownership. The American system is individualist—not collectivist.

Enterprise that is "competitive" calls for a "fair field and no favors." There must be no special privileges—for management, for labor, or for capital. It is competition that brings better values, higher quality, and lower prices.

Free, private, competitive enterprise is American enterprise. It is the way of doing business that brought the world's highest standards of living to America.

And when peace comes, American enterprise can do it again.

But American industry knows, and has a duty to tell the American people, that it will be impossible to have a post-war opportunity and jobs unless problems of the transition period—reconversion from war to peace—are solved wisely.

How to Speed Employment

Employment in industry will be speeded up if wartime controls are ended as soon as practicable after hostilities cease, if wartime taxes are then reduced, and if the government pays its debts promptly when it cancels contracts. Employment will also be increased if government makes clear that it will not operate plants in competition with private industry and that surplus war goods will not be dumped on the market.

If these and other reconversion problems are solved promptly, then American industry can move forward with confidence. Otherwise the best of plans for the future cannot be converted into opportunity and jobs. Freedom itself might be lost.

In order to get back on the road of opportunity—jobs—freedom in the post-war years the people of America should strive to:

1. Work together. Friendly and co-operative relations should exist among all Americans. Between management and labor. Between industry and agriculture. Between government and business. There must be no pitting of group against group. The ends sought are common to all.

2. Make government one of laws and not of men. America must reject all efforts to standardize human beings in a bureaucratic planned and controlled economy. The sound formula for national progress is the power and dignity of the free man, shaping his own destiny by his own self-reliant efforts. This is the way America achieved greatness in the past and can add to that greatness in the future.

3. Develop new frontiers. The road must be cleared for venture capital so that business—old and new, large and small —may provide the consumer with new and better products and the men and women of America with new and better jobs. Technical and scientific progress must continue.

4. Reward accomplishment. Men and women, be they workers, managers, or owners, should be rewarded in relation to their productive contributions. And those

25 YEARS AGO...

—WE SAID: *"Labor is just as efficient as management plans for it and gives it tools with which to work."*

This is one of the basic principles upon which our business was founded 25 years ago . . . principles which, like the laws of physics do not change.

Evidence that these principles have held through the years . . . that they still continue to operate . . . is found in the fact that our organization has satisfactorily consummated over 6,000 assignments for 500 clients since 1919.

And there is every reason to believe that such principles will just as efficiently apply 25 years hence and far into the future.

Management Engineering has not been successful because of spectacular planning or fly-by-night ideas, but because basic principles have been developed which not only govern labor controls, but inventory and material controls, planning and scheduling controls and all quality controls . . . and then, because these controls have been practically and wisely applied to all production processes.

The notable stepping-up of war production which has resulted from the application of these time-tried controls gives assurance of even greater successes in American production when the war years have passed.

1919-1944

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Brings to Industry

25 Years **OF MANAGEMENT ENGINEERING EXPERIENCE**

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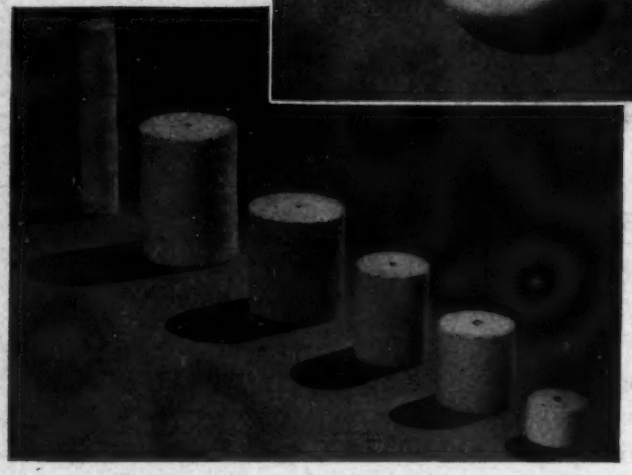
POLISHING AND BURRING



BURRING AND POLISHING

Small felt bobs and wheels! You could hold a dozen in one hand, but they are doing a giant killer's job in licking one of industry's most pressing production problems—the problem of removing burrs at low cost and without exceeding tolerance limits.

With them production schedules have been stepped up; losses by rejection have been reduced. Look to the Small Felt Bob or Wheel for the answer to your burring problem!

Bacon PARAMOUNT BRAND Felt and Wheels, coated with the proper abrading composition, are being used in hundreds of plants to remove burrs from a great variety of products. They're working on many different metals and plastics. The sizes and shapes of the bobs and wheels, too, are many because seldom are problems in any two plants exactly alike.

We'll be glad to design special bobs or wheels for your particular burring operation if none of our extensive line is suitable. In writing for our recommendations describe the part to be burred. If possible send a photograph, or better yet, the part itself.

Your Supply House can furnish
Bacon PARAMOUNT BRAND Felt Bobs and Wheels

BACON FELT COMPANY

"America's Oldest Felt Manufacturers"

Felt Does It Better WINCHESTER, MASS. *Established 1824*

who contribute must not be deprived of their rewards by taxes that destroy incentive. Tax laws that penalize success should be repealed.

5. Restore constitutional government. Legislative powers must be returned to legislatures. The checks and balances inherent in our American system of constitutional government must be restored.

6. Establish and maintain peace. Prosperity cannot endure with wars and threats of wars throughout the world. Our country should do its full share together with other nations in making effective international cooperation that will bring about and maintain world peace, so that the young people of America should never again be called upon to offer their lives in battle.

Framework of Program

These are the elements that will provide the framework necessary for post-war opportunity—jobs—freedom for the American people.

Within this framework American industry can provide the high level of business activity warranted by:

The vast backlog of demand for goods and services.

The new processes and new products.

The great productive capacity of America at work.

The tremendous potentialities of domestic and world markets.

Let there be no misunderstanding of the post-war plans of American industry. The program that is proposed will not provide something for nothing. Rewards must be earned—not given—so the program offers opportunity instead of a free ride, productive work instead of "made jobs," self-respect instead of alms.

Opportunity, jobs, freedom—for people all over America. With progress at home and peace abroad the whole national economy will prosper. This is the only way to attain progressively higher standard of living and sound economic security.

This is a program for all Americans. The goals can be won—by working together. And out of this unity will come a stronger, finer, greater America.

To the wartime pledge of production for victory, American industry adds this peacetime pledge:

To do everything within its power to produce and distribute better goods in greater volume at lower prices to more people, to make opportunity and jobs available to everyone, to help restore and preserve freedom.

* * *

Challenge to Industry

Alfred P. Sloan, Jr., chairman, General Motors Corporation, offered a challenge to industry—a challenge "presented least importantly in our own self-interest; but most importantly on behalf of the millions who, in serving our country in far-off fields of combat, are prepared to sacrifice their all, and in the interest of the tens of millions who are supporting such efforts by carrying on so effectively their appointed tasks at home. When the war is finally

EVER LOOK 2800° F STRAIGHT IN THE EYE?

RAW materials for cement are burned in large rotary kilns at temperatures up to 2800 F. Operators used to squint through dark glass at the white-hot clinker, and thus try to judge kiln temperature.

Today, instead, an electronic eye peers at the clinker, determines the temperature accurately, and transmits a signal to a special G-E motor and control. This automatically adjusts the speed of the kiln. Result: a cement of uniform quality!

This is a practical example of electronics at work for industry. As in many other electrical operations completely engineered by General Electric, electronic circuits were chosen to do the job faster, cheaper, more efficiently.

You can purchase *standard* G-E electronic apparatus that is ready for immediate installation. Or, where indicated, G.E. will design and build *special* apparatus. Back of each recommendation is an intimate knowledge of every field of industry — 25 years of experience in electronics. And, General Electric supplies the *complete electric equipment* of which the electronic apparatus is a part.

A call to our nearest office will put you in touch with a G-E industrial-electronics specialist. *General Electric Company, Schenectady, N. Y.*

Hear the General Electric radio programs: "The G-E All-girl Orchestra" *Sunday 10 p.m. EWT, NBC*—"The World Today" *news, every weekday, 6:45 p.m. EWT, CBS*

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the quick, effective, low-cost way with

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FREE 16 PAGE MANUAL GIVES COMPLETE DATA!

Controlling disagreeable, obnoxious, offensive odors . . . one of the most troublesome problems encountered in connection with plant housekeeping or processing operations . . . can now be accomplished effectively, easily by employing Oakite Deodorant No. 1. It quickly dissipates, without masking or camouflaging, practically all odors . . . such as those, for example, originating in or from

Cabbage	Decomposed foods	Smoke
Onions	Bacteria	Toilets
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Refrigerators	Decayed matter	Washrooms
Kitchens	Animal feces	Locker rooms
Refuse cans	Musty areas	Sewers
Storage rooms	Vomit	Drains

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By CLEANING and DISINFECTING as it deodorizes, this TRIPLE-DUTY material does THREE jobs in ONE simple, TIME-SAVING operation! It is safe to use . . . costs only a few pennies a gallon. FREE, 16-page manual gives further data . . . contains case histories outlining how Oakite Deodorant No. 1 is successfully solving a wide variety of odor control problems in many different industries. Write for your copy of this informative manual TODAY!

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over the cry from these millions of the most aggressive and productive elements of our people will be for an opportunity of accomplishment. A chance to live and to progress, and to avoid, above all, becoming an object of charity."

"I believe there are three clearly defined 'musts' the attainment of which would go a long way toward insuring our winning the peace and making certain that the sacrifices being made in winning the war will not be in vain," Sloan said. "These 'musts' are:

"1. Jobs for those who are willing to exchange their time and talents for a proper wage.

"2. Means to prevent further attacks on our civilization. There must be no World War III.

"3. International relationships in the economic sphere on the basis of a 'two-way' street."

In Sloan's belief we shall enter an upward spiral of business activity after the process of reconversion is completed. He is confident that there lies ahead an opportunity for accomplishment unparalleled both in magnitude and scope in the history of American enterprise.

Are We Prepared?

"The challenge is this," said Sloan. "Are we, representing an important section of the management of American enterprise, prepared to exercise our leadership and step up to this opportunity? Do we believe in its importance? Are we willing to take the risk? Do we consider it worth while? . . . I am sure American business leadership over the country believes it is, and will accept the challenge. . . .

"Here, in my judgment, are the more important components of faith and confidence:

"It is obvious that the rules involving governmental economic policies relating to the period of reconversion must be established now. How otherwise can management plan aggressively and intelligently and be prepared to act?

"The financial considerations involved in the cancellation of governmental contracts should be established. A proper selectivity in cancellation of one contract as against another with the objective of reducing the time of reconversion is of great consequence.

"There are also problems of the clearance of plants to be converted, of the disposition of government-owned plants, machinery, work-in-process, and materials.

"Consideration must be given to the release of material for engineering development of post-war products, to post-war reserves as a business expense, and to the elimination of overtime charges as the demands for war products decline.

"It is practically certain that enterprise will have to operate on the basis of part war and part peace economy following victory in the European theater of war. Plans should be made accordingly.

"The major part of the essential reconstruction of governmental national policy in the period to follow reconversion lies within the tax structure. The new

DOING TOUGH JOBS *Fast*

takes the Speed and Stamina of

SKILSAW TOOLS!

EVERY MAN
COUNTS FOR MORE
USING SKILSAW TOOLS!

SKILSAW BELT SANDERS—Speed all sanding and surfacing on all materials!

SKILDRILLS—Light, compact, powerful for faster drilling everywhere!

It's the *punch* and *power* of SKILSAW TOOLS that makes them favorites in War Plants today. It's the *punch* and *power* of SKILSAW TOOLS that will make them favorites with you! SKILSAW TOOLS are rugged, dependable, *faster-working* . . . they'll bust tough bottlenecks, boost production and stand up longer under hardest usage. And SKILSAW TOOLS are light, compact, perfectly balanced . . . they'll handle easier, do more jobs and do them better.

Want to see for yourself how SKILSAW TOOLS can save money, minutes and manpower in your own plant? Ask your distributor for a demonstration of SKILSAW TOOLS today!

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Special Tool Maintenance Manual

There's a big Special Section on the Care and Operation of Electric Tools in the *new* SKILSAW CATALOG! Full of illustrations and valuable suggestions on How to Get the Most from Your Electric Tools in War-time.

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SKILSAW PORTABLE ELECTRIC **TOOLS**

★ *MAKE AMERICA'S HANDS MORE PRODUCTIVE* ★

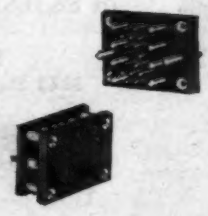
COLUMBUS DIDN'T HAVE ONE

COLUMBUS did his navigating with a dime-store compass and a piece of string. But all he discovered was America. Boy, what exploring the push-button admiral of the future will be able to do with this self-aligning, automatic, instantaneous astrolabe.

We don't know if there is going to be such a thing but if there is and it's in the realm of electronics (there's that word again) Cannon plugs will be in there pitching.

For wherever quick, complete, sure electrical connections must be made—whether to carry a single circuit or a maze of circuits —a Cannon plug is indicated. Nothing less is so surely satisfactory. Nothing better can be had.

Panel Type DP-N26 (pin and socket insert assemblies shown) is one of the many types of Cannon Connectors that will serve radio and instrument applications of tomorrow's inventions as well as they are serving today's products. We'll be glad to send you a copy of the new second edition TYPE DP Bulletin.



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Cannon Electric Development Co., Los Angeles 31, Calif.

Canadian Factory and Engineering Office: Cannon Electric Co., Ltd., Toronto

REPRESENTATIVES IN PRINCIPAL CITIES—CONSULT YOUR LOCAL TELEPHONE BOOK

approach must be different from that prevailing in the pre-war period. . . . Some better way must be found. Taxes on enterprise itself must be drastically reduced. . . . Capital should be free to move within the economy. . . . Excessive taxes should be eliminated for the sake of stimulating production through lower prices.

"International economic relationships must be on the basis of a 'two-way street.' No world WPA at the expense of the American taxpayer.

Importance of Labor Relationships

"Labor relationships represent probably the most urgent social, economic, and political question as affecting the entire home front and the opportunities of expansion of enterprise that may be expected to develop, according to present trends, as we pass into the post-war period.

"It must be the responsibility of the management of private enterprise to direct its planning and its resources toward reducing to the minimum the period of unemployment involved in the process of reconversion.

"Orders should be released promptly for the replenishment of inventory required for the production of peacetime goods, now liquidated. Likewise, orders for stocks of supplies and parts, while parts are being rehabilitated.

"Orders should be released promptly to modernize equipment in line with technological progress and to bring maintenance up to normal standards.

"Orders should be released promptly for plant and equipment and expansion of working assets to raise capacity to the new levels as established by the possibilities of the post-war era.

"Engineering development should be prosecuted aggressively as materials and manpower become available, to the end that new products may become available and old products improved.

"The responsibility of management of private enterprise from the standpoint of its longer-pull position must involve, as its most fundamental concept, technological progress . . . research and engineering development must be encouraged.

"The wage rate must be recognized and dealt with, not as the predominating issue between two groups, but as one of the most important economic problems involved in the whole economy because of its dominating influence on costs and selling prices. . . .

"An incentive should apply not only to capital in the form of a profit, but likewise to management and workers. All should have an opportunity to progress directly according to their individual ability and their willingness to contribute.

"The economic formula that production is equal to consumption plus savings should be respected. . . . Savings must not be permitted to become static.

"The price policy of enterprise is one of its most vital responsibilities. Costs should be established on the basis of a practical rate of utilization over the long term of all the economic resources of each particular business as measured by a realistic estimate of its actual productive capacity. Every effort should be made to re-

Announcing

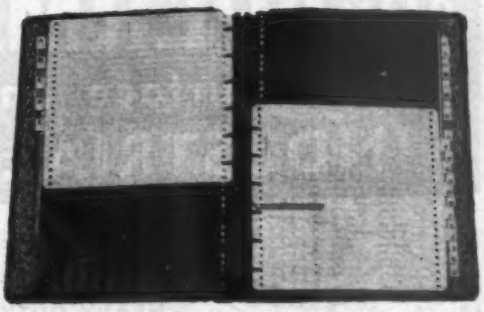
TWO NEW DIEBOLD PRODUCTS

Visible Records Equipment Company, producers of Tra-Dex and Flex-Site equipment, is now a division of Diebold, Incorporated

TRĀ-DEX
VERTICAL VISIBLE FILES

Ideal for machine or hand posted records. Thousands of records, with three-way visible margins, are at the operator's finger tips. Sectional and manifold models in a wide range of capacities, and accommodating cards of any size from 3x5 to 15x12

FLEX-SITE
VISIBLE BOOKS



The advantages of bound and loose leaf books *plus visibility.* A method of record-keeping that is preferred by many because of the convenience of portability, ease of operation and the adaptability to record forms of all types and sizes.

WORTHY COMPANIONS TO

Cardineer ROTARY FILE

The sensation for smooth record-keeping routines. A wheel brings any one of 6000 records instantly to hand. Speeds finding, filing, posting.

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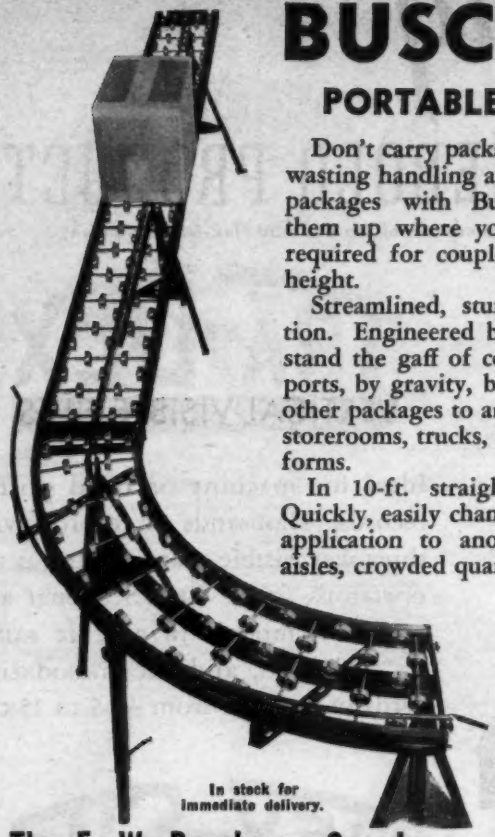
DIEBOLD
"Systems to Fit the Routine"

CARDINEER	TRA-DEX	FLEX-SITE
ROTARY FILES	VERTICAL VISIBLE FILES	VISIBLE BOOKS

SOLVE THE PROBLEM · SPEED THE WORK · REDUCE THE COST



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PORTABLE CONVEYORS

Don't carry packages. Do away with time-wasting handling and rehandling. Transport packages with Buschman conveyors. Set them up where you need them. No tools required for coupling sections or adjusting height.

Streamlined, sturdy, rugged in construction. Engineered by conveyor specialists to stand the gaff of continuous service. Transports, by gravity, boxes, cartons, crates, and other packages to and from production lines, storerooms, trucks, boxcars and loading platforms.

In 10-ft. straight and curved sections. Quickly, easily changed from one location or application to another. Ideal for narrow aisles, crowded quarters. Low in cost!

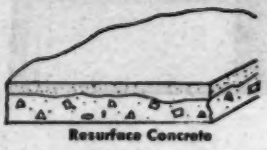
Write for Bulletin 8 showing many applications

In stock for immediate delivery.

The E. W. Buschman Co., Inc., 419 New St., Cincinnati 2, Ohio

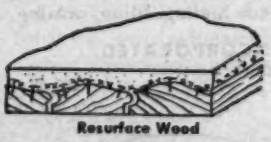
Use "PERMAFLEX"

Resurface and Patch INDUSTRIAL FLOORS



Resurface Concrete

Patch Concrete to a Feather Edge



Resurface Wood

BONDS PERFECTLY — NEVER COMES LOOSE

3000 lbs. pressure per sq. in. will not rut

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Install right over your old Floors, Walks and Drives.

No need to remove machinery, finish right up to it. No Chipping. No Dust. No Delay. Install Friday night and Saturday, ready for use on Monday. Never a failure in over 1,000 installations.

Our Contract Department can do the installation work for you at any rate to 30,000 sq. ft. per day.

AMAZING! UNBELIEVABLE! Until you try "PERMAFLEX"

Users include U. S. Steel, Bethlehem, Republic, General Motors, A. O. Smith, Western Electric and leading Railroads.

Lowest cost and most durable industrial flooring ever invented

Write for 100 sq. ft. trial offer

INSTALL COMPLETE 12½c per square foot

PERMAFLEX PRODUCTS COMPANY
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duce business fluctuations and eliminate their harmful effects.

"Cost savings, from whatever source, can produce the most effective result in promoting job opportunities and expansion of enterprise, when expressed in the form of lower prices to the consumer."

* * *

Post-War Planning for Enduring Peace

The successful outcome of actions in New Guinea, the Solomons, Africa, Sicily, the Aleutians, and Italy, and the bombing of Germany has caused optimism and a certain satisfying feeling that these things are going as they should, according to Rear Admiral W. M. P. Blandy, USN, but the drawback is that a lot of people "are now convinced that both the Germans and the Japanese will fold up in short order, that the hard work is over, and it's a down-hill coast from here on in."

Admiral Blandy, too, believes that the worst is over, as far as any possibility of our final defeat is concerned. But he expects "a long, up-hill climb" and he does not anticipate that "we can be uniformly successful in everything we undertake. Our victory will not be won without continued efforts, equal in devotion and efficiency to those put forth in our days of greatest uncertainty."

Speaking of post-war planning, Blandy said, "The problems of returning to your peacetime manufacturing will be as difficult in many ways as the conversion of your plants to war work. The government must fully cooperate in this readjustment, and is preparing to do so. . . . You gentlemen, as leaders of industry, are also leaders of your country, and I urge that the problems of our post-war military situation be integrated in your programs. No one can still have any illusions that this country can escape playing a larger and more active part in world affairs after this war. . . . Two wars in a generation are sufficient proof that America is in world politics to stay.

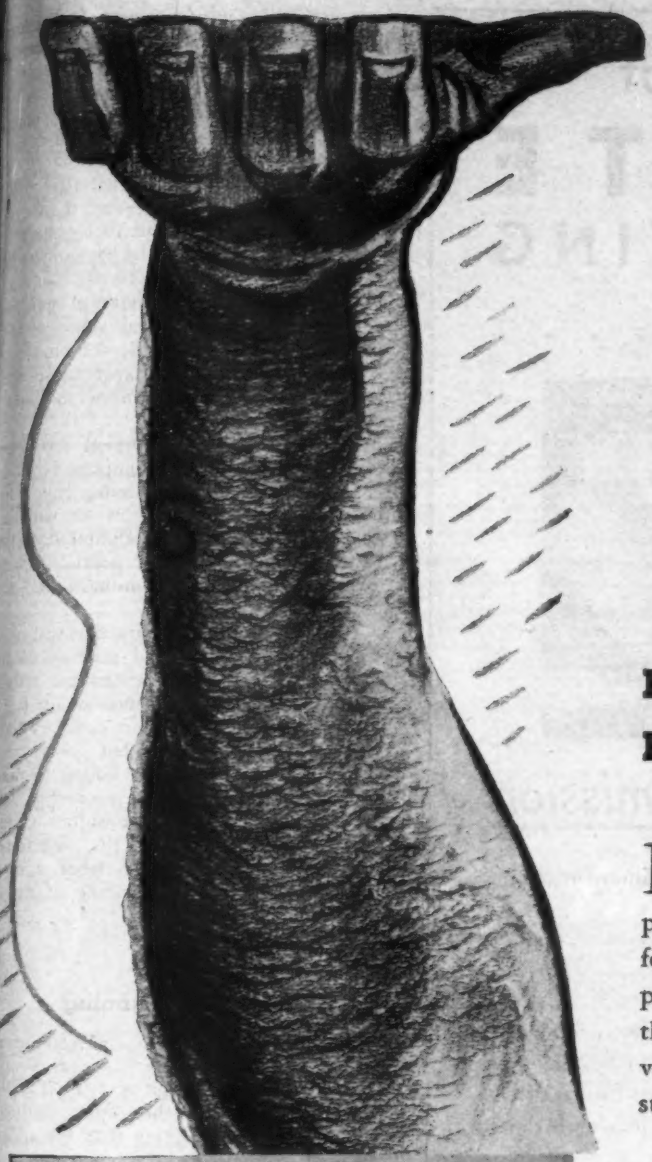
"The standard by which we must measure our course is whether it increases or imperils our national security. Any hope for a durable peace must inevitably be accompanied by the practical realization that unimpaired ability to wage a war promptly and triumphantly will be our underlying guarantee of such peace. To be able to do this the Army and the Navy must depend greatly upon American science and industry for continuous research and for the development of new weapons and uses of principles and techniques determined in industrial as well as educational laboratories."

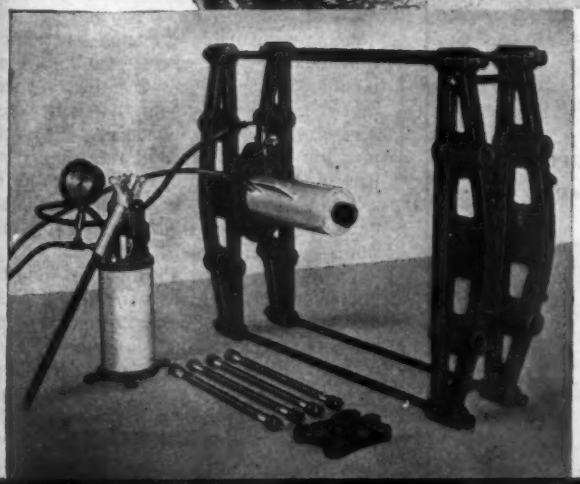
* * *

Post-War and the Government

Preserving private enterprise at home after the war is just as important as preserving peace abroad, according to Wilfred Sykes, president, Inland Steel Company.

"The greatest post-war problem today is, will government let go of private enterprise so that it can again be free?" he said. "A related problem of perhaps equal





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Where PULLING, PRESSING OR LIFTING POWER IS NEEDED . . . .

Rodgers Universal Hydraulic Presses have been purchased by many large industrial shops equipped with large stationary presses. Plant engineers and foremen recognize the advantage of having a powerful portable hydraulic press to take to the repair job, and the convenience of doing many press jobs in the Universal Press which are difficult to handle in a large stationary press.

Contractors and service repair shops alike will find it both convenient and profitable to use the Universal Press Equipment wherever they have heavy machinery to repair or overhaul. The Universal Press will save you both time and expense. *If it's a Rodgers, it's the best in Hydraulics.* Rodgers Hydraulic Inc., St. Louis Park, Minneapolis, Minnesota.

Manufacturers of:

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TRACK PRESS EQUIPMENT
HYDRAULIC KEEL BENDERS
HYDROSTATIC TEST UNITS
POWER TRACK WRENCHES
HYDRAULIC PLASTIC-PRESSES
PORTABLE STRAIGHTENER FOR PIPE AND KELLYS

Rodgers HYDRAULIC Inc.

These features of TANNATE LEATHER BELTING add up to . . . . . .

Economical Power Transmission

1. *Tannate* has a firm pulley grip that assures maximum machine speeds even under varying load conditions.
2. *Tannate* has unusual strength . . . averaging ⅓ to ½ higher than choice oak belting.
3. *Tannate* has endurance needed for long work weeks.
4. *Tannate* has long life . . . requires little maintenance except occasional applications of Tannate Belt Preserver.
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6. *Tannate* is flexible . . . runs easily over small pulleys with short centers and high pulley ratios.
7. *Tannate* withstands moisture, machine oils and many weak chemicals.
8. *Tannate* will help increase your output and lower your cost.

Write for a handy belt length calculator. Figures belt length quickly and accurately — It's free.

STEP UP PRODUCTION with
RHOADS
Tannate
WATERSHED
LEATHER BELTING

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importance is, if government frees enterprise, in what manner will it do so?

"Whose company would be let out first, and given the first chance at hiring skilled men and entrenching itself in new fields, while some other company is still in the government service?

"How are the essential materials to be distributed at the outset—that most critical period? Are materials to be allocated to a company according to the amount of capital involved, that is, by size; or is it to be done by the number of jobs involved? Or is the social value of the goods to be considered—for instance, should the government favor those who supply the farmers who need machinery and parts?

"Obviously, the government has some responsibility for giving competitors a fair, clean, equal start in freeing them for civilian operation. But how far will this go? It would be an abandonment of the historic separation, if the political system assumed prolonged responsibility for the economic system.

"Moreover, the government must generalize its controls. And generalities are difficult to fit into an enterprise system established and run by individuals. . . .

"We should pledge and demand that, when the still unformulated government policy in freeing enterprise comes to practical peacetime application, each step shall be taken on reasonable consultation and cooperation among all the interested groups—whether enterprise, labor, agriculture, government, or the public in any of its various aspects."

* * *

Post-War Planning

"America's infant, but most prolific, industry, is post-war planning," said Walter B. Weisenburger, executive vice-president, NAM, speaking on the topic "Industry Has a Program." Stating that his speech did not contain any discussion of such "major immediate problems as termination, reconversion, reserves, and plant disposal," Weisenburger said industry is seeking to furnish leadership that a free, self-respecting people will accept. "It is not just for business, except as business is a part of American life. It is a program for a better America, in which all can share—labor, agriculture, the trades, the professions—all the people."

"The time-tested formula of industry, out of which a high standard of living has been built, is better articles cheaper for more people," he continued. "With high-priced government and rising unit labor costs, that's going to be a tough formula to maintain. How can we do it?

"Not by lowering wage rates, because that would reduce the income of consumers and damage our markets. Not by reducing the rewards for saving and investment, because that would choke the flow of capital and expansion. Not by limiting the rewards of business enterprise, because that would restrict the important function of creating new jobs and providing wealth for all.

"How then are prices to be reduced? Simply by an increase in individual productive efficiency. More production re-

Rapid assembly revolves

around the Speed Nut System

(PATENTED)

• SPEED NUTS are lighter in weight than other approved self-locking nuts. Hence they are handled easier and faster. They permit use of shorter screws thereby saving additional weight and assembly time. They are widely used with coarse threaded A.N. sheet metal screws which weigh less, and having fewer threads per inch, require less turning. Many types of SPEED NUTS are quickly snapped into screw receiving position and hold themselves in blind location for assembly. This eliminates costly riveting of nut plates and speeds up assembly operations.

Many other SPEED NUTS are available that combine several parts into one. They eliminate unnecessary handling of parts and speed up assembly still more. Write for summary catalogue No. 185.

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FASTEST THING IN FASTENINGS

"NO CHAIN ABSENTEEISM WITH T-M CHAINS On the job!"

Executives are first to recognize the relation of chain quality to operation and production. Taylor chain making begins *at the beginning* with material, and follows through with chain engineering, and design for every requirement.

Electrically Welded T-M Chain—Chain links are automatically butt-welded on machines of this type.

For lifting or pulling, or for slings on overhead equipment you will find the dependable chain or fitting in the complete T-M line.

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T-M
S. G. TAYLOR CHAIN CO.
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quires an increased measure of cooperation between management and labor . . . Labor is not exempt from the rule that any one contributor to the production process who sets out to grab more than his proper share thereby hampers production and so ultimately becomes his own enemy.

"But how about short-sighted management? Short-sighted management can—and sometimes has—tried to make its profits by short-changing its workers. That just won't do. Any time wages fall below what the workers produce, markets dry up, and management is left holding the sack of unsold inventories.

"When we say that management is offering a plan for competitive enterprise, we mean just that—no monopolies, no fixing of prices.

"We want all the competition we can get. We want free and open markets—no special privilege and no special protection.

"Management can't go down to Washington seeking regulatory laws for its competitor or price-fixing for its industry, and still be considered an advocate of the fully competitive business system. Price rigging always means small markets, and enterprise does not fully succeed with restricted markets.

"Management, too, must put its house in order, and by the character and spirit of its labor policies create a relationship with its employees which is built on mutual respect and good will.

"Where collective bargaining is entered into, it should be carried on in good faith. Sound employment relations policies should be adopted and administered fairly, uniformly, and without discrimination throughout the entire organization.

"We'd better realize, also, that we have some social responsibilities. If it's going to be left to us to control the forces of production, we'd better control them so that they are kept busy in the service of the American people. Keeping the wheels turning when it happens to suit us, won't be quite enough. We'd better keep them turning all the time. America isn't going to be run for the benefit of business. We had better run business for the benefit of America.

"If there is any benefit in industry, government should recognize it, too. The great uncertainty—the fear uppermost in the minds of managers, investors, workers, all of us—is what will be the post-war attitude of government toward private enterprise. Nothing could give more encouragement—nothing could build greater confidence for the future—than a forthright rededication by Washington to the private enterprise philosophy which made this country great."

* * *

What's Ahead for 1944

Although he is certain that victory is on the way, and a better world will follow, Charles E. Wilson, executive vice-president, War Production Board, emphasized that plenty of hard work is immediately ahead. "The fight in Europe looks to me like a long, hard, bitter fight," he said. "Unless we are exceptionally lucky, it will be costly in lives beyond the expectations

WHIZ Floor Primer and Cleaner removes imbedded dirt and wax from wood, linoleum, rubber, asphalt, cork, terrazzo, and concrete floors—desk tops, table tops, metal furniture, venetian blinds, woodwork, etc. Truly a remarkable cleaner and pre-wax treatment.

A real labor saver—cleans chemically without scrubbing. Just spread over surface, let stand few minutes, rinse off. Penetrates pores, flushes out imbedded dirt and grime. Wax base acts as filler, seals openings, becomes a binder between surface and next wax treatment. *Write R. M. Hollingshead Corp., Camden, N. J., for name of nearest distributor.*

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as

DIRECTOR OF PROGRAMS AND RESEARCH

RICHMOND L. CARDINELL is the exceptional combination of an Electronics and Mechanical Engineer, a research authority with a brilliant record of achievement, and a musician, composer and conductor.

He has long been recognized as an outstanding national authority in the field of Music-in-Industry. He conducted the basic music-in-industry studies, in association with Professor Burris-Meyer at Stevens Institute of Technology, where he served as Research Engineer and Instructor.

In addition to these studies, he has conducted research on the general effects of auditory stimuli on human beings, and on the development of equipment and techniques for controlling sound for theatrical purposes.

Called in by the Government, he extended his music-in-industry studies as a member of the Office of Production Research & Development of WPB.

As of January 1944, Mr. Cardinell has accepted full-time appointment as Director of Programs and Research for MUZAK. Ben Selvin will continue to serve as Music Director and Consultant, devoting his time principally to supervising the production of new music for MUZAK.

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The World's Leading System of PLANNED MUSIC for Industry, for Offices, for Public Places

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BUFFALO—Transtudio Corporation, 473 Virginia St.
CLEVELAND—Ohio Music Corporation, 1120 Chester St.
DETROIT—Michigan Music Company, 112 Curtis Bldg.
LOS ANGELES—The Pacific Network, Inc., 2625 Wilshire Bldg.
MIAMI BEACH—Florida Music Corporation, 940 Lincoln Road Bldg.
PHILADELPHIA—Muse-Art Corporation, 526 Schaff Bldg.
WASHINGTON—Music Incorporated, 912 Sixth St., N. W.
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of most of the American people. The cost in material will be equally heavy . . . it will tax both our capacity for sacrifice and our capacity for industrial production beyond anything we have experienced so far . . . What I have said of the European war can be underlined with respect to the Asiatic war. . . .

"The essential fact is that the 1944 over-all schedules call for performance higher even than our current rate—a performance 80 percent above our 1942 record. These schedules are continuously under review, and it is the constant effort of all of us who are concerned with them to see that we shall produce only things which are genuinely needed for the successful prosecution of the war. I believe that, in general, subsequent revisions will not be upward. But after carefully canvassing the matter with all of the procurement agencies concerned, I can offer you my considered opinion that, barring unexpectedly early termination of the war in the European theater, such revisions will not substantially reduce our 1944 production below present levels."

* * *

Better America—Post-War Program

Industry's post-war program for a "Better America" calls for full production, the highest standard of living, jobs with a full measure of freedom and opportunity, according to Frederick C. Crawford, president, Thompson Products, Inc., and retiring president, NAM.

"We are the managers of production," said Crawford. "Jobs in the better America require a full measure of production. Today, the American people are looking to business management for leadership. No longer will criticism do. No longer can we be negative. Today, we must have a positive plan, and act, under a banner, to lead the American people.

"This better America must belong to all of us, not to any class or group or segment of our society. American people distrust all pressure groups. A program for a better America must benefit all. Through our war production, the American people have developed a profound respect for the leadership of American industrial management. Today there comes to American business management the greatest opportunity and responsibility that have come in many years, with this returning confidence in the leadership of business management."

* * *

Management's Job

Summing up his speech on "Management's Job," H. W. Prentis, Jr., president Armstrong Cork Company, and past president, NAM, said:

"Management's job is, first, to devise a program. That has been done. That program must now be publicized to the American people and their representatives in Congress. To sell it effectively, management must understand the principles of the American republic; apply the political and ethical philosophy on which it is based to the conduct of the every-day

THERMOID PRODUCTS get the "tough job" calls

To nudge awake that great, stricken hulk of the "Normandie" was a task calling for patient skill—and products of utmost dependability.

In this amazingly successful operation, we are proud to report, Thermoid Products had an important part... round-the-clock service that forcefully confirmed the reputation for reliability they had earned on many another "tough job."

Thermoid's policy of designing products to meet the demands of the unusual jobs and overloads makes outstanding performance the standard Thermoid service record. The engineers and production specialists who design and make Thermoid Products know *your* needs. They *build* into Thermoid belting, hose and brake lining the performance these products must *deliver* on your jobs.

When products bear the name "Thermoid," everyone in your organization knows you are buying the best.

Don't put it off 'til tomorrow . . .
BUY MORE WAR BONDS TODAY!

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affairs of business; be articulate in the interpretation of those principles to the public; test every governmental proposal against those basic concepts; support every constructive move, whether it springs from management, labor, agriculture, or government, that will make for a better and more productive America; and last but not least, emulate the faith and courage that characterized the men who came to the shores of this new continent to escape the religious, intellectual, economic, and political tyranny of the Old World."

* * *

Rehabilitating the Handicapped

Industry's job is to produce and distribute as economically as possible those goods which society wishes to enjoy, according to Robert M. Gaylord, president, Ingersoll Milling Machine Company, and newly elected president of the National Association of Manufacturers. And industry has a responsibility, too, to rehabilitate disabled veterans who return from the war. Industry's part in the rehabilitation program is not identical with society's responsibility, but it offers an unexcelled opportunity for enlightened management to assume one of its "much talked-of and little-defined social responsibilities."

This job is important, and it is new, Gaylord said. Top management must take an active, personal part, so that it does not become a matter of routine before all its potentialities have been explored. The following important aspects of the problem are clear to us now—others will develop as time goes on:

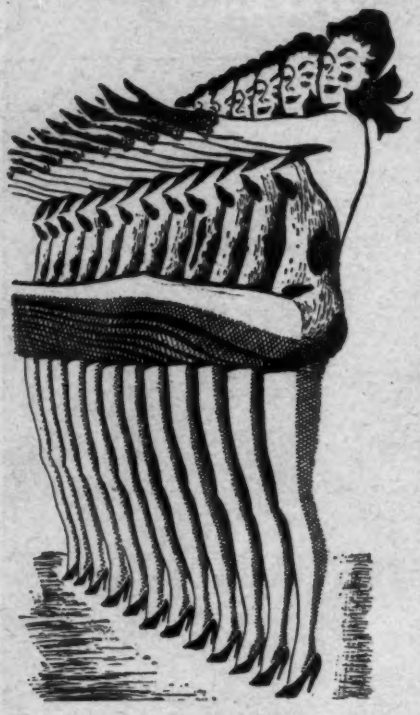
1. The handicapped veteran must not be allowed to grow to feel that, because of his disability, he is an object of charity. Rehabilitation is not merely a matter of bread and butter. Everyone recognizes that, but industry sees it with peculiar clarity, because management knows that discontent and self-pity quickly rob producers of their efficiency.

2. The handicapped veteran must not be allowed to feel that he has a right, because of his disability, to a livelihood at industry's expense, merely because he attends regularly his place of industrial employment. He must have the right to earn his way, and to know that he will not be discriminated against because of his disability.

3. While he is being encouraged and trained to become a productive and self-sustaining individual, it should be done in such a manner that his individuality develops, his earning power increases, and his own dignity grows because of the work he is doing.

4. Industry has had a great deal of experience in the past three or four years in training men and women to acquire new skills, by breaking down complex operations into simple ones so that less skilled men and women may perform them; in adapting shop work to women's skills; and in teaching employees of different races and colors to work together profitably. Rehabilitation of disabled vet-

UNFAILING PRECISION



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HO-ZOF, when used according to directions, turns accumulations of grease and oil into a soap-like fluid—which is easily "hosed" down the drain or removed by electric mopping machine.

HO-ZOF restores greasy metal, wood, glass, linoleum, brick, stone or cement surfaces. Ideal for removing unwanted grease from floor areas, shipping platforms, hand and machine tools, truck chassis, engines and parts, hotel kitchens, elevator pits, boiler rooms, etc.

SAFE. Non-inflammable. Non-explosive, no toxic fumes. Contains powerful disinfectant. Inexpensive. *Write Industrial Dept., R. M. Hollingshead Corp., Camden, N. J., for name of nearest distributor.*

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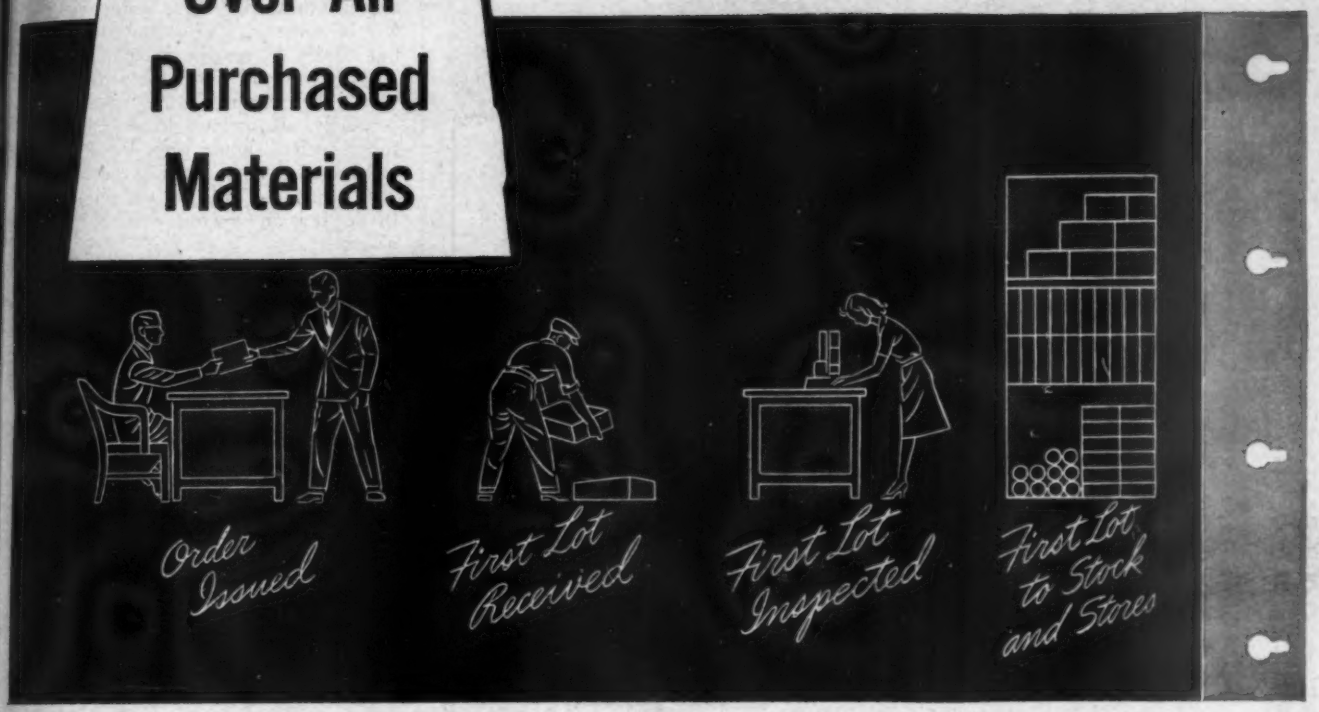

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No more inside manufacturing delays caused by confusion about what raw material has been received, passed inspection and is in the store bins.

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And no more wasteful rewriting of receiving and inspection records.

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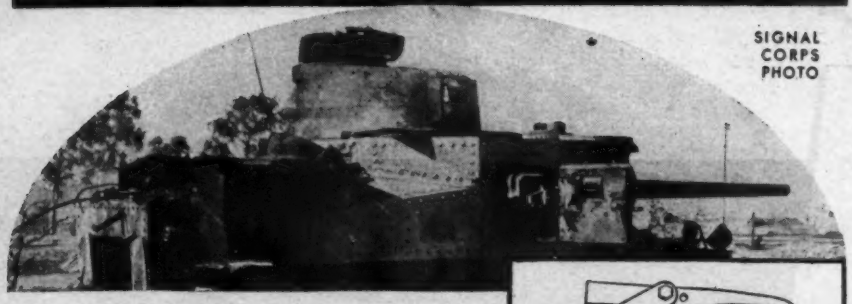

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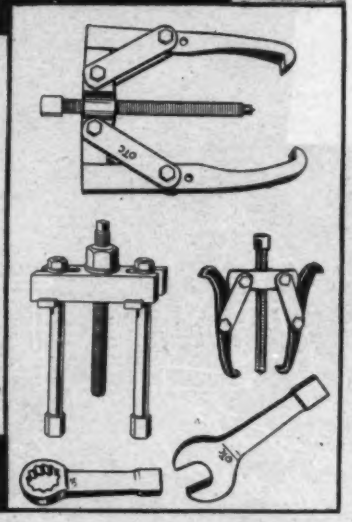
In this Mechanized War—tools are vital equipment. They *have* to be *good*—sturdy and efficient—sure, safe and speedy in use.

OTC Wrenches, Pullers and other Tools have met the most exacting War demands. They are serving in the Army, Navy, Merchant Marine—and in War Factories, Ship Yards and Airplane plants.

Available on proper priority. Tell us your needs.



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Simplex No. 30HJ Hydraulic Jack, capacity 30-tons. Has two pumps—high and low speed—which can be operated singly or in unison. Two release valves for convenience. No. 50HJ, same design, capacity 50-tons.

These new 30 and 50-ton Simplex Hydraulic Jacks have been perfected to facilitate the big jobs. Construction is extra-rugged throughout, including base of special analysis steel. Double lever socket facilitates operation in close quarters. Sold by leading supply houses.

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Better, Safer Jacks Since 1899

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Simplex
LEVER · SCREW · HYDRAULIC
Jacks

erans is only an enlargement of this field, in which there is still much to learn.

5. It is not entirely management's responsibility. Labor must cooperate with management to make it work effectively. For instance, seniority rights may have to give way in some instances, just as accepted employment practices may have to give way in others.

6. There will be some disabled veterans handicapped so severely they cannot find a place to work within industry. There will be some who will not want to work, but prefer to remain federal pensioners. Those who fall into these two classes should be recognized and cared for accordingly. If society decides to pension them, society should carry the load. The purchasers of manufactured goods should not bear the expense of rehabilitating them. It is an expense to be borne by all of society.

7. Obviously, the larger units in industry must take the lead in this program. The larger operations offer a greater diversity of jobs. Their personnel departments and their training programs can more easily assimilate this new phase of old work. Smaller units should not neglect it, but smaller manufacturers must depend upon the larger ones to take the initiative, to do much of the exploring—in short, to lead the way.

* * *

Tribute to Industrial Workers

The Japs and Nazis are learning the hard way that American industry is the greatest productive force the world has ever known, according to T. M. Girdler, chairman, Republic Steel Corporation, and chairman, Consolidated-Vultee Aircraft Corporation.

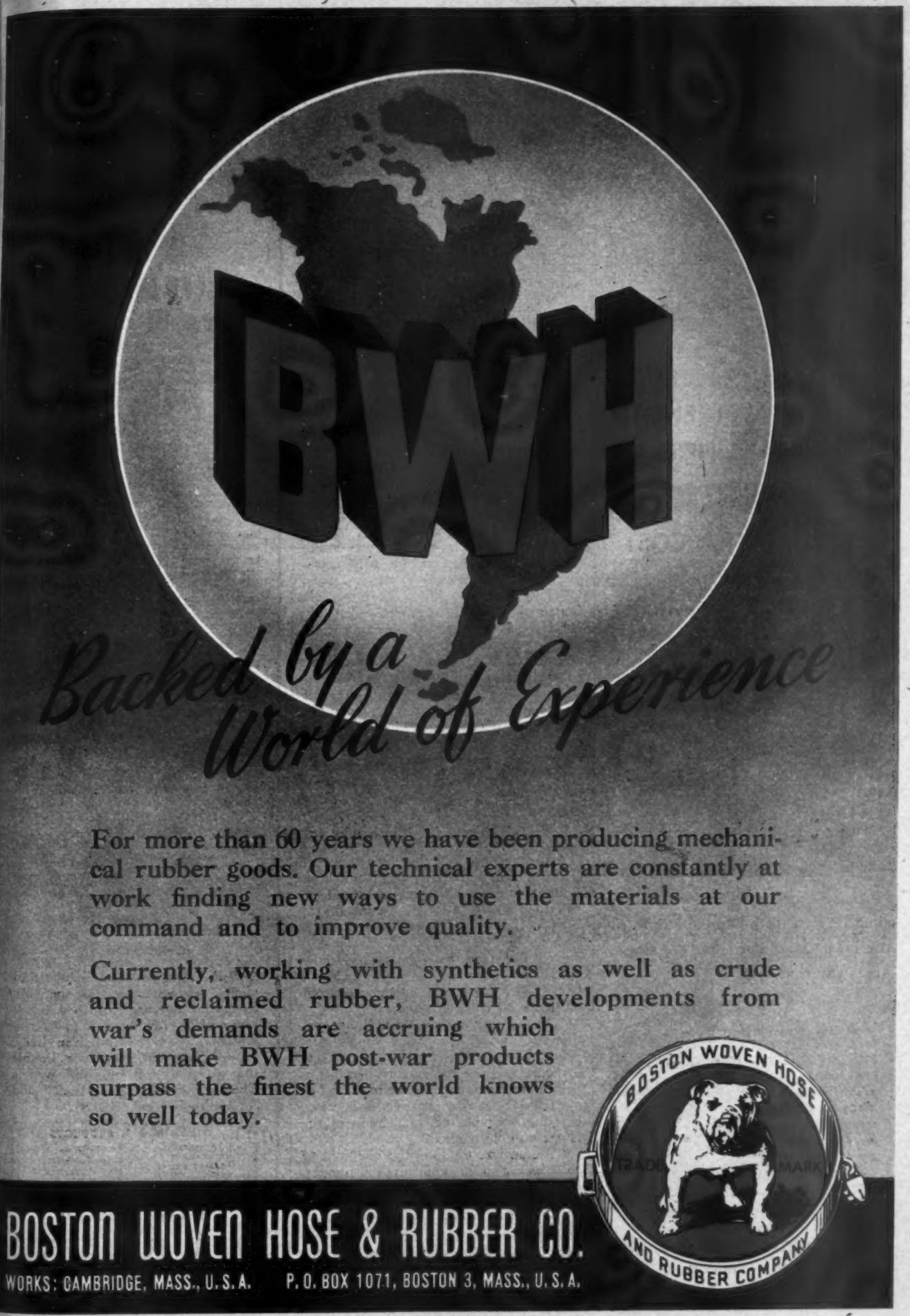
Magnificent results have been achieved, and in that achievement industry has had the loyal cooperation of millions of workers, Girdler said.

"I speak not only of the men and women normally employed in industry, but also of that great number of courageous women who have left their homes or given up softer jobs to come into the war plants. I speak of the youngsters and oldsters and the physically handicapped who have gone on the production firing line. All these have helped make industry's job possible.

"Employees in the plants have not only worked with their hands, they have also worked with their heads. They have come forward with unnumbered suggestions for improving the efficiency of the job, for saving precious time or material.

"Industry has encouraged this kind initiative in many ways. It is part and parcel of the American system under which men have an incentive to better themselves and, in doing so, advance the welfare of the nation.

"And so the suggestions that have come from workers in the plants, together with the spectacular over-all planning and organization of management, have added up to the notable achievements of industry in this war. Sometimes these achievements are characterized as miracles, but I say mistakenly so. I say that the results are just



For more than 60 years we have been producing mechanical rubber goods. Our technical experts are constantly at work finding new ways to use the materials at our command and to improve quality.

Currently, working with synthetics as well as crude and reclaimed rubber, BWH developments from war's demands are accruing which will make BWH post-war products surpass the finest the world knows so well today.

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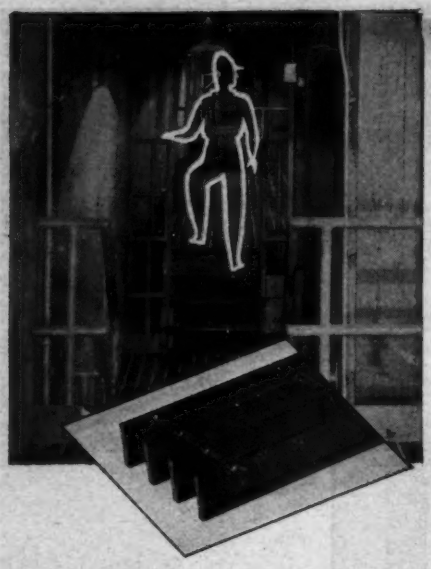

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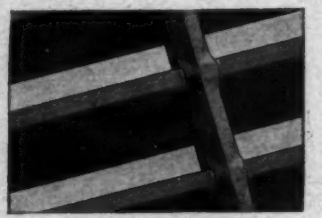
The clean fillet weld you see on that section of BATES-GRATES gives you a combination of maximum strength and floor safety that makes it very much worthwhile to specify BATES-GRATES for your open steel flooring.



Note the crisp, dirt-and-grease-shedding tread the entire length of the Hex Cross Bar. BATES, alone, gives you that, too.

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OPEN STEEL FLOORING • STAIR TREADS

what we should have expected. They are the natural outcome of America's creative enterprise operating within the pattern of an economy that rewards men for work well done.

"Call it the profit system or the incentive system or private enterprise or what you will. The fact remains that under it, American industry has given in this war a smashing demonstration of its tremendous vitality and its vast potentialities.

"There was a time not long ago when it was fashionable in some circles to pretend that private enterprise was outmoded and about to topple of its own weight. But industry's performance in the war has given the lie to that kind of talk.

"American enterprise is dynamic, not dying. It will face the problems of peace with every chance of success unless impossible obstacles are heaped in its path.

"I say this with full knowledge of the nature of these post-war problems . . . The reconversion of our industrial equipment is not in itself an unsurmountable undertaking. What industry has done, it can do again—probably with even greater efficiency . . . What is a matter of prime importance is the economic and political atmosphere in which industry will function in the post-war period. That in the final analysis must be determined by the people of America. They must decide whether they want to preserve or to scuttle the American enterprise system . . .

"How can these things be preserved? Certainly not by class conflict. Certainly not by the technique of government by selfish pressure groups. Certainly not by predatory practice on the part of capital, by over-control on the part of organized labor, nor by regimentation on the part of government. They can be preserved only if we can achieve unity of purpose. If each important group will recognize that its prosperity can be secured permanently only by promoting the general welfare."

* * *

The Reason for Cutbacks

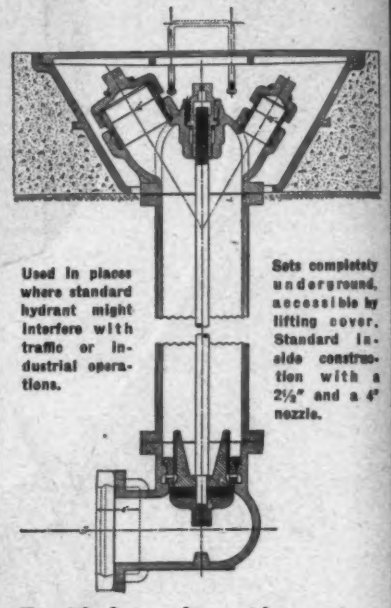
A phenomenal thing in this war is that at no time in battle have our forces been without an adequate supply of armament, said Maj. Gen. Levin H. Campbell, Jr., chief of ordnance, United States Army. Although previous experience in war had proved that men could be trained more quickly than their arms could be produced, "never once has our production been out of step with battle requirements."

"Once it becomes apparent," he continued, "through the army supply program, that we have ample stocks of any particular piece of equipment, then in justice to our men on the battlefronts and to our fellow-citizens as taxpayers, it becomes our duty to taper off production in the fairest possible method.

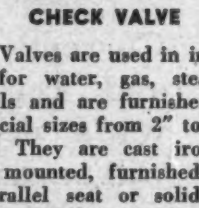
"We analyze carefully the questions of costs, we weigh the problems of manpower, we consider the difficulties of storage, transport, and safety. As a matter of fact, there are 16 separate points to be considered whenever there is a question of cutback in production, and then we take the steps so that the effect will have the least harm for all concerned.

"As this war goes on and as the effi-

FLUSH TYPE Fire Hydrant


Used in places where standard hydrant might interfere with traffic or industrial operations.
Sets completely underground, accessible by lifting cover. Standard inside construction with a 2½" and a 4" nozzle.

Furnished complete with cast iron nozzle box and cover, with drop handle.



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M & H Valves are used in industrial plants for water, gas, steam, oil, chemicals and are furnished in all commercial sizes from 2" to 30", inclusive. They are cast iron body, bronze mounted, furnished double disc parallel seat or solid wedge. They are heavily proportioned and have a high factor of safety.

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MANAGEMENT EMPLOYEE RELATIONS

Quickly and Effectively

1. MANAGEMENT INFORMATION

This service—in the form of weekly bulletins sent to department heads, foremen and supervisors and edited by Glenn Gardiner and Associates which contains a weekly letter reporting important current management news items for supervisory consumption. It provides information to help meet and solve such problems as handling of people, control of costs, reduction of waste, maintenance of quality standards, prevention of accidents, organization relations, training and instructing, application of job-psychology, methods improvements, self-improvement. A sample copy of a current issue of MANAGEMENT INFORMATION will show you how these subjects are covered in a condensed, easy-and-quick-to-grasp manner.

2. BULLETIN BOARD SERVICE

Elliott Industrial Bulletin Board Service and Displays are designed to constantly stimulate the minds and energies of your employees with their important part in the battle of production. Displays are attention-getting, up-to-the-minute and make workers THINK, REASON and ACT. This service provides a medium also for friendly messages and local news from management to employees as well as the means for promoting safety, morale and friendly relations. Any special need can be quickly and effectively met by this Elliott Service.

3. EMPLOYEE SUGGESTION SERVICE

Today's battle is being won by applying new ideas on the production line. To enlist the aid of workers in stepping up production by encouraging them to submit their suggestions for improved methods is the basic purpose of Elliott Suggestion Service. It provides a simple, practical means to help you tap the store house of ideas that lie in the minds of your workers.

4. MANUALS FOR FOREMEN

by GLENN GARDINER

These manuals are keyed directly to the war effort and cover subjects of immediate concern to foremen responsible for improving their war production. Titles are as follows:

1—"How to Train Workers Quickly"
2—"How to Handle Grievances"
3—"How to Create Job Satisfaction"
4—"How to Cut Waste"
5—"How to Get Out More Work"
6—"How to Correct Workers"
7—"Qualities of a Good Boss"

Actual experience over a period of thirty-three years has demonstrated that practically every day-to-day problem faced by management in its relations with employees can be solved. Elliott is not attempting to tell you what these problems are or what specific problem you are facing at this particular moment. However, Elliott is prepared to state with authority and back it up with actual case evidence, that the problems which come within the scope of the services Elliott offers have been solved to the satisfaction of management and employees alike. There can be no question as to the basic correctness and value, therefore, of Elliott Services which are designed to fit industry's needs specifically.

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When you want this kind of service—from an organization which has rendered it continuously, successfully and with industry's full appreciation of its worth—call on Elliott.

The coupon below will enable you to receive samples of the Elliott Services outlined above.

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and have checked those on which I would like additional information. It is understood that this request incurs no obligation on my part.

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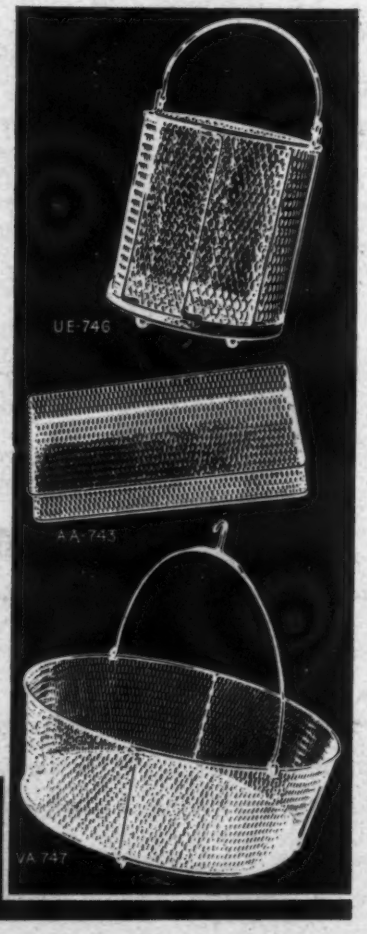

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ciency of American industry increases the production rate of weapons, at continually lower costs, and in continually growing quantities per man-hour, it becomes your duty, as well as ours, to taper off that production; but always only after our armies in the field are adequately supplied for the present and their future needs are safely stored against most adverse conditions."

* * *

Women in Industry

Industry is beginning to wonder what women will do after the war. Will they want to continue in the jobs they have handled so well during the emergency, and what effect will their wishes have on the economic situation in the post-war world? Most of them will want to go back to their homes, is the belief of Ruth M. Leach, vice-president, International Business Machines Corporation, who said, "What I believe that women want is not to *keep* (their) jobs, but the *freedom* to keep them."

"Women have much to contribute to the post-war era," Miss Leach stated. "They can add new attractiveness to the myriad of new and better products which your factories will make. They can both soften and strengthen human relationships and help bring about better understanding between labor and management. . . . Participation in industry has provided women with the opportunity of acquiring knowledge of the business world. This knowledge, combined with the self-confidence it inspires, and based upon the sympathetic understanding so naturally characteristic of women, will enable them to lend much more effective assistance in social, economic, and political affairs, thereby becoming far better citizens than they would have been before."

•

Electric Industrial Truck Bookings Higher

Domestic bookings of electric industrial trucks and tractors during the month of September, 1943, totaled 712 units, according to figures released by the Industrial Truck Statistical Association, 208 S. LaSalle Street, Chicago.

The net value of chasses only booked during that month totaled $3,943,962.40, compared with $2,930,767.50 in August.

The September bookings included 4 non-elevating platform trucks, with capacities and chasses base prices ranging from 4000 to 6000 pounds and $2040 to $3295, respectively, and a total net value of $9425; 676 cantilever trucks with capacities and chasses base prices ranging from 2000 to 20,000 pounds and $1375 to $8950, respectively, and a total net value of $3,791,229.40; 15 light and heavy-duty tractors with chasses base price ranging from $1650 to $1755 had a total net value of $25,230; 16 crane trucks with capacities and chasses base prices ranging from 6000 pounds at 7 feet to 10,000 pounds at 5½ feet and $6340 to $8150, respectively, had a total net value of $113,-

Electronic VARIABLE SPEED MOTOR DRIVE

Westinghouse MOT-O-TROL

AUTOMATICALLY HOLDS SPEED STEADY UNDER VARYING LOADS

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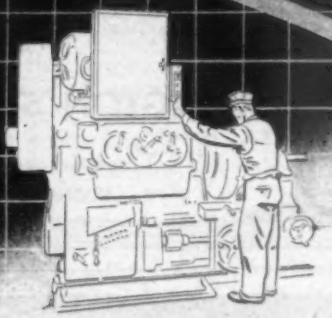
CONVENTIONAL MOTOR DRIVE



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POWER TRANSFORMER
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DC
STANDARD CONTROL STATION
D-C. SHUNT MOTOR
MOT-O-TROL rectifies alternating current and supplies direct current to field and armature of a d-c motor. Speed control dial on control station varies these voltages through electronic rectifying tubes—thus changing motor speeds. Acceleration current also is limited electronically.

ELECTRONICS AT WORK

- **Wide, Stepless Speed Range**
- **Automatic Speed Regulation**
- **Smooth, Fast Acceleration**
- **Automatic Current Limitation**

Once speed is set, MOT-O-TROL, the new Westinghouse motor control, maintains pre-set motor speeds under all loads and makes possible new, wide-range stepless selection of motor speeds.

With the precision of electronics and finger-tip control, MOT-O-TROL operates d-c motors from an alternating-current source. It is a marked improvement over conventional d-c motor drives, even where d-c is available.

All drive speeds are controlled by one dial. MOT-O-TROL equipped machines have only one rotating element . . . the driving motor. Vibration problems are minimized, acceleration is smooth, starting shock and current peaks are reduced. Other available MOT-O-TROL functions include: dynamic braking, reversing, inching forward, inching reverse.

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Airplane wheel dolly with adjustable floor and self-locking automatic brace arms.

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IT'S THEIR STAMINA! Definitely proved thru grueling production schedules day after day . . . ABBOTT BEARING BALLS give dependable, uninterrupted performance . . . THEY CARRY THE LOAD AS PLANNED.

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883; and 1 special truck with capacity of 3000 pounds had base price and total net value of $4195.

All net values are at factories after additions and deductions for variation from standard specifications and trade-in allowances, when applicable.

•

Management's Job—Now and in Post-War World

(Post-war planning, production research, incentives, foremen, quality control—all these and more subjects of vital interest to management were discussed at the 64th Annual Meeting of the American Society of Mechanical Engineers, held recently in New York. FACTORY presents here some of the opinions expressed, and quotations from some of the speeches.)

Production Research

What most needs to be done in the way of production research at this time? Under this general head, a panel discussion brought forth the opinions from which the excerpts below were taken.

Introducing the subject, L. C. Morrow, editor, FACTORY, said:

"I have chosen to treat the subject of today's discussion on a broad basis. My premise is that, in specifying what most needs research in the field of production, we have in mind as a goal the achievement of greater output per unit of input of human energy, materials, and power. I therefore suggest as the items or matters that may properly be considered: Equipment, processes, methods, materials, people.

"Is equipment giving the greatest output possible consistent with the production possibilities of tools and operators, and consistent with costs? Can there be developed technological changes which will make the machine capacity exceed tool capacity by an amount that will impel research and consequent technological development in tools? Is the reverse true; that is, can tools be developed to the point where their production capacity will greatly exceed that of machines?

"What production processes are declining and what ones are growing, and what are the causes for decline and growth? For example, machining has long been the major process of preparing metal parts for assembly. To what extent are the various machining processes being replaced by casting in its several forms, by welding, by extrusion, and by pressing and forming? To what extent can these processes be still further developed? Also, to what extent can machining processes be further improved so that their productivity will once again surpass the productivity of the growing processes of today?

"To what extent can manufacturing methods be revised to eliminate waste? How close to 100 percent can machine working time be approached? To what extent can physical exertion on the part of the operators be eliminated? To what extent can we depend upon power-driven equipment and gravity to do handling?

Wet Abrasive Belt...A Faster and Better Surfacing Method

By developing abrasive belts of greatly advanced cutting power, plus effective coolants, plus a machine that can maintain close tolerances — .0005" when desired — a new and better surfacing method now becomes available. Its application through the Porter-Cable line of Wet-Belt Surfacers is breaking old, familiar bottlenecks, and revolutionizing many manufacturing and assembly procedures. It is equally effective on the newer and less common materials such as magnesium, aluminum, plastics, compositions, glass, as it is on steel, iron or brass. This is of special interest now that the growing use of novel materials places a premium on the versatility of machine tools.

FASTER ON ALL THESE OPERATIONS

1. Chamfering
2. Rounding
3. Squaring
4. Forming radii
5. Grinding flat surfaces
6. Grinding parallel surfaces
7. Polishing
8. Removing tool marks

A Coolant for Each Material

A variety of coolants, each developed for a specific material, totally eliminate heat and dust. This feature alone would be enough to call the new technique revolutionary, for without heat a number of irksome finishing problems are automatically eliminated: flow, warping, burring, scoring, discoloration, weakening or breaking down materials of low fusion point. Without dust, health hazards, discomfort, and possibility of damage to other machines are minimized.

With both material and belt cool, belt speed can be greatly stepped up, and in consequence, new peaks of efficiency become possible. The term "abrasive" is outmoded, because the material is not removed by a rubbing action, but by actual cutting with millions of minute points, in a straight, continuous path, producing chips that resemble those of a miller or lathe. An entire area, as large as 9" x 17", can be worked at once. It also becomes possible to produce final finish while taking the cut. The result is a spectacular increase in output —5 to 25 times that of a miller cutting a small section at a time.

Curved and Irregular Surfaces

For curved and irregular work, interrupted surfaces and very small pieces, the Porter-Cable Model B-6 was specially designed. It uses a narrower belt, flexible enough to follow contours and get into places inaccessible to ordinary power tools. For repeat operations, backing plates that fit the contour of the work can be used. All the operator needs to do is present the material to the belt to obtain flawless finish with production-line speed.

To take full advantage of the inherent accuracy of Wet-Belt Surfacing, Porter-Cable offers an oscillating table with micrometer stop. It is T-slotted, and will accommodate a variety of angle plates and fixtures. With this attachment even an inexperienced operator can work to close tolerances.

So great is the versatility of Wet-Belt Surfacing that it is being used on many jobs no one thought of at first, and each new application opens further possibilities. In some plants it's an integral part of the production line. In others, the assembly department finds it invaluable in reducing parts to fit. In tool-rooms, it's in constant use for squaring, generating arcs, knocking off corners, burrs, fins. It supplements die and pressure casting machines by removing flash, bosses and sprues; or a shear press or band saw, by taking off the sharp edges.

Valuable Booklet

We would like to tell you more about Wet-Belt Surfacing. We have prepared a 32-page booklet that is virtually a treatise on the subject. You are cordially invited to send for a copy. It is called "A New Precision Machining Method." Please use your letterhead and state your title when asking for it.

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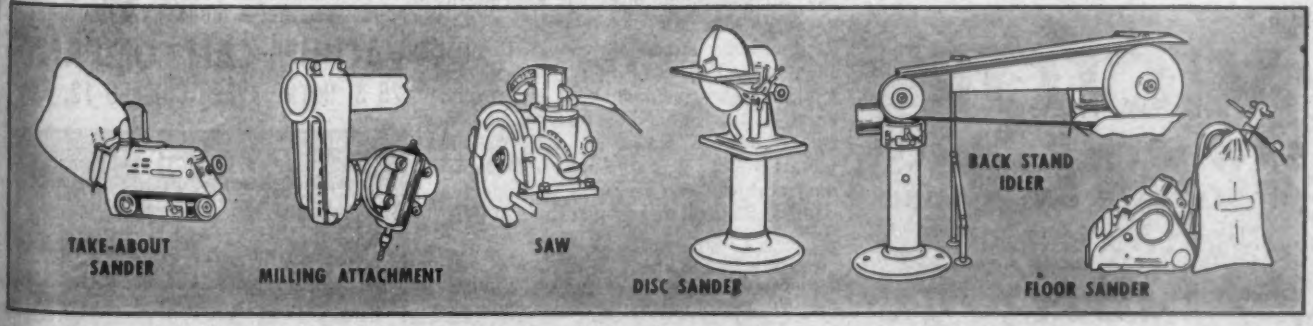
Other Porter-Cable Machines Widely Used in Industries



The maintenance man is a key factor in the war-busy industrial plant. Machines and equipment MUST be kept running. Time lost by breakdowns means lost production. Good tools are as important as the mechanical skill of the man using them. These men PREFER the VICTOR high-speed steel "MOLY" Type* Hack Saw Blade for fast, accurate cutting; and the Unbreakable Special Flexible Blade for tough sawing in inconvenient places.

That's why VICTOR Blades are the favorites in industrial plants for cutting aluminum, brass, copper, steel and alloys. On tubes, bars, flat stock, angles and cable. There is a VICTOR Blade for every kind of metal sawing job.

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Makers of Hack Saws, Frames, Band Saws and Power Saws. 5135

What is there ahead in the betterment of effective coordination and utilization of the motions of the human body in work?

"What can be the future of quality control? Will much of our inspection in mass production be influenced by the statistical methods of quality control now being developed? How far can we go in developing completely automatic inspection for dimensions and quality—a great deal of such automaticity being achieved by electronic devices in all probability?

Improvement in Materials

"Are there not possibilities for the further development of an improvement in materials? The story of the development of materials, as speeded by the war need, has by no means been told. It seems to me that all we can suggest here today is that there probably are extensive opportunities for improved design of materials and for better application of materials that will make for easier working, for longer wear (or for shorter wear), and for lower cost of product. Perhaps the road that research should follow will be clear after we have found time to learn of the many applications of recent developments in materials about which industry as a whole is not well informed at this time.

"It may well be that I shall be challenged because I include people as one of the items that are subject to research under the over-all heading 'Production.' However, whether it is justified or not, there exists today among a great many of industry's production executives the opinion that the most remunerative production research which can be undertaken is the study of people to determine under what conditions they will give maximum output. What makes people work well? Is it good health, food, nutrition, music, quiet, good industrial relations, education? Can the study of human relationships in industry be classified as production research? I throw out the thought for what it may be worth.

"Of one thing I am convinced, which is that research will have to be carried on along all these lines if we are to achieve the national result commonly accepted as a goal that must be reached if the combination of democracy and individual enterprise to which we are accustomed is to continue. If private enterprise is to afford job opportunities for all who are not economically employed in agriculture, government, part of distribution, and part of the service occupations, then production of the goods and services which must make up the high standard of living that all of us envision, will have to be brought about by economical production. We shall have to achieve as nearly as we can the lowest possible costs of production in order to allow sales prices low enough to bring about a distribution of industry's goods and services wider than we have ever experienced. That is the only way we shall be able to achieve a high standard of living for everybody; it is the means by which our industries can be given a production demand that will mean a plenitude of jobs."

* * *

Speaking on the same subject, Philip S. Criblet, personnel manager, Worthington

Here Comes the Hot Coffee!

Welcome! You can say that again

There just is no other way to service hot coffee to your workers indoors, outdoors, day shift or night shift, that will match the low cost efficiency of hot coffee service with "AerVoiD" Vacuum Insulated Coffee Carriers.

And is hot coffee appreciated by factory workers? You wouldn't ask the question if you had ever tried it. Just stop and reflect that it takes 91,300,000,000 cups of coffee per year, according to official figures, to satisfy America's coffee-craving, and you have the answer. No other beverage can point to such a pronounced public preference.

No, the "pin-up" girl in our plant is not Betty Grable, not Rosalind Russell, not Deanna Durbin, but the girl in the immaculate white uniform that shows up mid-morning and mid-afternoon with a delicious cup of hot coffee for everybody . . . office and shop. Hundreds of industrial War plants already have "AerVoiD" hot coffee service combating fatigue-lag in their workers. Cold days emphasize the need for this low-cost morale-builder.

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"AerVoiD"
VACUUM INSULATED CARRIERS
FOR STORING, TRANSPORTING
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IS YOUR POWER SYSTEM OVERLOADED?

Do You Want More Capacity . . . Quickly . . . Inexpensively?

CAPACITOR PLUG mounted on BUStribution DUCT (handle on plug cover permits operation from floor).

Capacitor Plugs help in these ways!

1. Inserted in any of the plug-in openings of your BUStribution DUCT, BullDog Capacitor Plugs increase the capacity of your electrical system by reducing the reactive KVA, thus ensuring lower operating temperatures and preventing needless fuse blows and production shutdowns.
2. They permit installation of Capacitors at the nearest point to your motors. As the load center shifts, the plug-in Capacitors can be shifted with it.
3. They represent a *decentralized,* and consequently more flexible, arrangement of Capacitors. Even if a unit should fail, the power factor correction of the entire system would not be affected, as it would with *centralized* banks of Capacitors.
4. They make possible the strategic location of Capacitors at the points in the system where poor power factor occurs, and this improves conditions for the rest of the equipment all the way back from the motors, through the bus duct, through the secondary switchboard, to the transformers.
5. Capacitor Plugs not only improve your power factor, but save valuable space and critical materials such as copper and steel . . . to say nothing of man-hours and production saved because of fewer blown fuses and greater operating efficiency.

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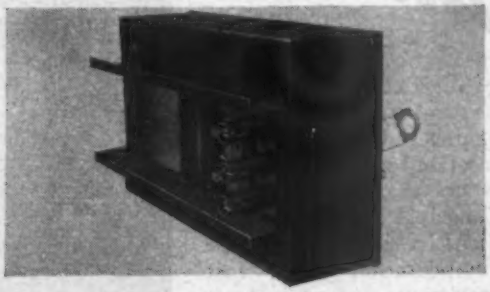
New BullDog Capacitor Plug

You don't have to worry about space or supporting means for these Capacitors. Just plug them into the BUStribution Duct. It's as quick and easy as that! Rated from 1 to 15 KVA, complete with fusible switch or circuit breaker in one compact handy Plug for 230V or 460V 60 cycle.



Rear view of Plug showing bus contact fingers for plugging into openings along bus duct runs.

Capacitor Plug with front cover removed, exposing fusible disconnect switch and capacitor unit.

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The greedy jaws of Brownhoist clamshell buckets speed up material handling in dirt, clay, coal, gravel and ore. Their deep, clean bites practically eliminate hand shoveling. Extra sturdy. Large sheaves reduce rope wear to a minimum. AVAILABLE IN ROPE-REEVE, POWER-WHEEL AND LINK-TYPE. For facts and prices write to Industrial Brownhoist Corporation, Bay City, Michigan. Offices in New York City, Philadelphia, Pittsburgh, Cleveland and Chicago.

Guard those hands the safe, efficient way!

The easiest, most practical way to insure press-punch operators against the dangers of torn, lacerated or smashed hands, is to use Junkin Safety Guards! . . . What's more, Junkin Guards *reduce* compensation costs, lost man-hours — and *increase* production! . . . Worth investigating — and worth investing in! So, write for *free* booklet "Power Press Protection" today! No obligation. Junkin Safety Appliance Co. Incorporated, 936 West Hill Street, Louisville 8, Kentucky.

JUNKIN SAFETY GUARD

Pump & Machinery Corporation, said that in the course of his work in research, field engineering, shop supervision, and personnel management he had coped with "all five of the 'M's of production'—machines, materials, minutes, money, and men" and had come to the conclusion that the fifth M—men—presents the greatest field today for production research and development.

"Devising automatic machines, developing new materials, improving methods, all are necessary and valuable projects," Criblet stated. "But men are required to execute them. Thus, basically, all problems resolve themselves into the single problem of getting more and better work out of the men we have."

Criblet approved a recent suggestion that industry needs personnel engineers instead of personnel managers. "Personnel engineers should be as carefully selected and trained and as close to their problem as are the chief design engineers and factory superintendents. With the engineer's approach, with properly engineered personnel policies and practices, any company can reduce turnover, improve efficiency, and increase production, and do it without the services of any high-priced theorists," he said.

To raise a personnel department to its proper level, Criblet suggested these steps:

1. Top management must be awakened to the urgency of the situation, and the results that can be obtained.

2. Personnel officers must be chosen from men who know the plant and its manufacturing problems.

3. The doors of the employment office must be thrown wide; today we can't afford to turn away an applicant because he has no gleam in his eye—the next fellow may not even have an eye.

4. Trainees for skilled and semi-skilled occupations must be given a formal induction training program by men who know the jobs and the problems.

5. Line foremen must be brought together in directed discussion groups to improve their job knowledge, assist them in the further development of trainees, and help them solve their personnel problems.

6. Employees who wish to leave the company must be cleared through a key executive who is charged with the responsibility of salvaging desirable cases. This exit interviewer needs the wisdom of Solomon and the patience of Job; he must be able to recognize real problems and engineer their solution. . . . If he knows the jobs in his plant he can arrange transfers and iron out difficulties to the mutual benefit of the employee and the company. . . . He can contribute in no small way to the production rate of his company, and must be an integral part of the well-engineered personnel department.

* * *

Wartime Research

Discussing "Wartime Research and Development—a Molder of Engineering," Harold V. Coes, president, American Society of Mechanical Engineers and vice-

"Oh Dear–12 More Stops to Make!"

President Smithers is handling deliveries himself, today. And, as you see, he's away behind schedule.

Joe, his delivery man, would finish in half the time. For Joe has the job down to a series of orderly, organized operations. Here, as everywhere in business or industry, routinized work is *swift* work.

One of the biggest benefits that Uarco Record Forms bring business and industry is to make sure that every operation is performed in the swiftest, most efficient way.

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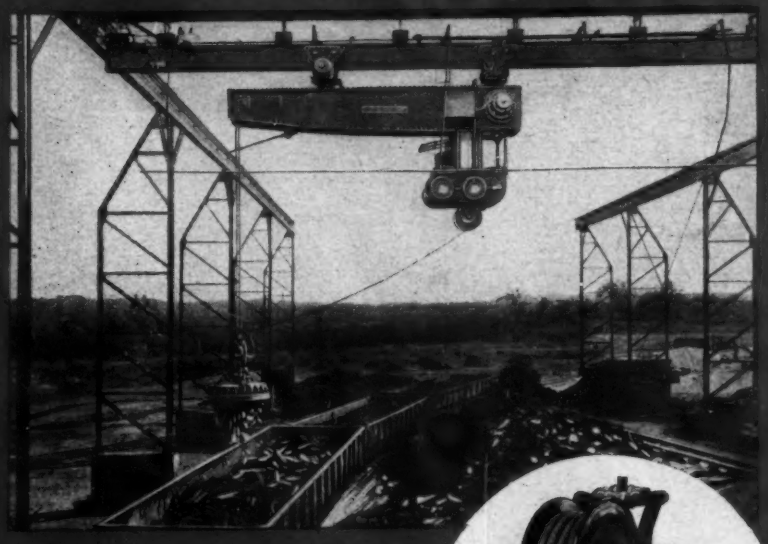

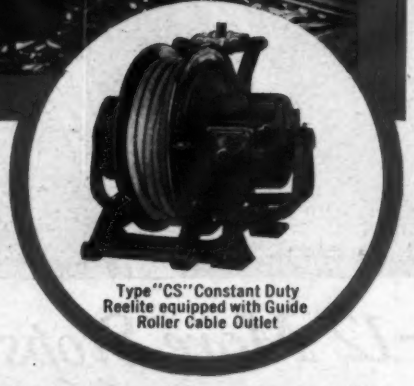

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Thousands of Constant Duty Reelites are supplying constant current with safety, to movable units of every size, from giant cranes to portable hand tools.

They're expediting war production in shipyards, on assembly lines and in war plants generally.

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KEEPS CONDUCTOR CABLE SAFE AND SOUND

APPLETON ELECTRIC PRODUCTS

APPLETON
CONDUIT FITTINGS • OUTLET AND SWITCH BOXES • EXPLOSION-PROOF FITTINGS • REELITES

president, Ford, Bacon & Davis, declared "the United States will be finished as a progressive dominant nation, if we regiment and unduly restrict free enterprise and free effort, and if we block the path of 'the boy from across the tracks' to attain through his own efforts the highest position in the land."

The rapid development of the radio, airplane, and the dye and chemical industries was directly due to World War I, Coes said, and it is reasonable to assume that new industries will evolve from this war. We cannot turn back from the new developments of scientific research. Their impact on engineering design and application will be tremendous, and engineers must be prepared for it.

The pressure of war is compressing into a few years, research and development work that under normal peacetime conditions would be spread over many years. The synthetic rubber industry is a good example—an entire industry producing from 800,000 to a million tons a year, created in about eighteen months.

Some of the things that may be expected as a result of compressed research and development were outlined by Coes: "Aluminum at 10 to 12 cents a pound . . . recovering from brine or sea water approximately 100 times the magnesium produced in 1939 . . . new steel alloys with tensile strengths of 190,000 pounds per square inch . . . a transparent armor, proof against bullets, extremes in temperature, and dangerous sun rays . . . glass manufactured in curved, triangular-shaped pieces . . . in automobiles, different and better springing, non-flammable fabrics, sealed cooling systems, less weight, higher mileage per gallon of gasoline, tires that may run from 50,000 to 100,000 miles . . . helicopters, air express trains, cargo carrying dirigibles . . . new plastics . . . television."

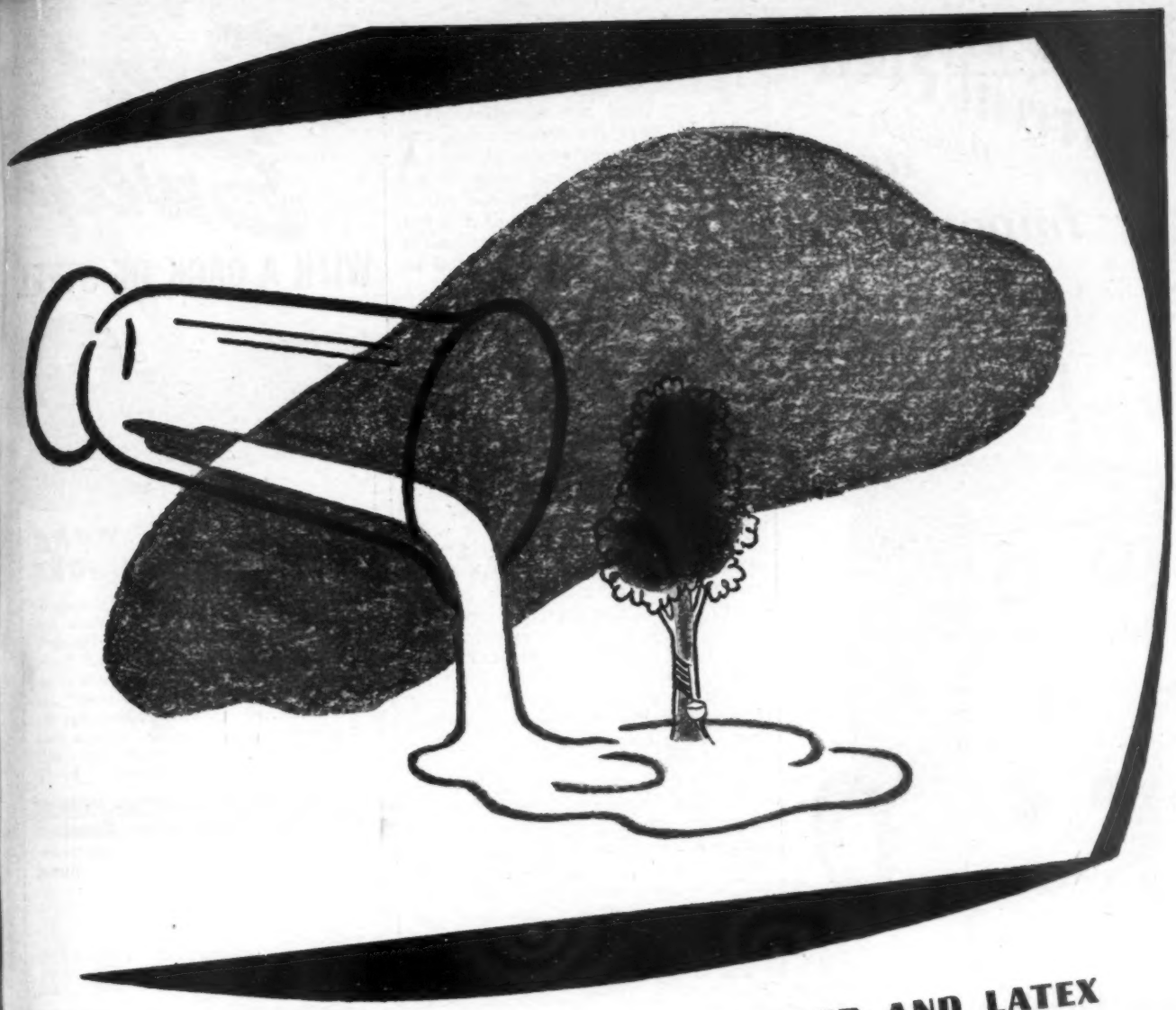
In conclusion Coes stated: "I have never had any patience with the idea that the industrialization of the United States is complete, that there were no new opportunities to explore and pioneer. I have lived long enough to see the telephone, electric light, electric train, radio, airplane, automobile, steam turbine, and a host of other things developed, perfected, and put into man's daily use. No, the United States is not finished, its economy will not be static, so long as free men and women are at liberty to choose what they want to do, to back their ideas, and to develop."

* * *

Union Membership for Foremen

The fact that he had been invited to speak on the subject, "Union Membership and Collective Bargaining by Foremen," was proof to Robert H. Keys, president, Foremen's Association of America, that the officers and members of the ASME are alive to the issues of the day. "We foremen," he said, "recognize and pay tribute to, the ingenuity, energy, and creative brain of the engineering fraternity, which has been largely responsible for the tremendous growth of American industry."

"In May of this year the National Labor



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Relations Board, by a vote of two to one, ruled that supervisory employees do not constitute appropriate units for collective bargaining. That decision still stands, but it has not killed our association at all, and won't. For the simple reason that we still have our grievances, only more so, since that unconstitutional ruling. It is a decision that can be reversed, and even if it isn't, there are other boards and procedure, provided by law, which will enable us to secure our reasonable demand for collective bargaining and security.

Minority Opinion

"The adverse NLRB decision was given in the matter of the Maryland Drydock Company. It is entirely too long a ruling for me to quote, but, of the three members, it is significant that the man who voted the minority opinion in our favor is the chairman of the NLRB, Harry A. Millis. I will, however, quote some very interesting conclusions that Millis wrote in his dissenting opinion. He said, 'The employers' case against foremen's organization and collective bargaining, in addition to the *fallacious claim* that supervisors are management and not employees, repeats many of the arguments formerly used by anti-union employers against the organization of rank and file employees in these same industries. In reaching its conclusions, the majority fails to give proper weight to the distinction between the two essentially different aspects of the position of foremen. On the one hand, they are agents of management, carrying out, although not formulating, management policies in the plant, mine, or shipyard. As such, they act for management as the first step in the handling of grievances of rank and file employees, but they do not, in most cases, make decisions on grievances except in minor matters. They have no active part in the collective bargaining conferences between management and the union of rank and file. In fact, one of their grievances is the lack of provision for conferences between management, foremen, and men on problems affecting all three groups. On the other hand, they are employees, in groups running into hundreds and even thousands in the great war industries, with serious problems of their own, as employees, in their relations to the management. It is these problems, *not whims*, which have led to the current movement by these men for self-organization and collective bargaining. Parallel movements are found elsewhere as in Great Britain for example.'

"Many arguments, most of them far-fetched, have been advanced by management as to why foremen should be prohibited from unionizing. At hearings on the Smith Bill in Washington before the House Military Affairs Committee this spring, I heard some arguments voiced by big executives that were quite indicative of the kind of thinking that has made an outstanding 'fall-guy' of the average foreman during the past several years. One of these super-duper statements was, 'You can't serve two masters.' Using that statement with reference to unionization of foremen is a reprehensible attempt to make mincemeat out of the Holy Bible. Anyone can go through the Bible and pick

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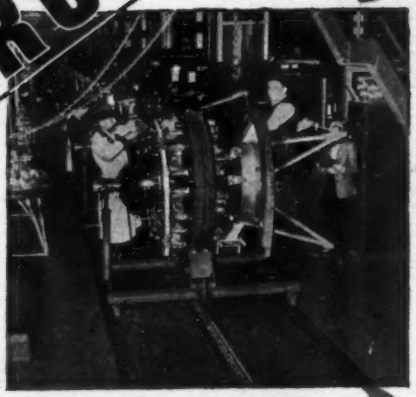

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out quotations to justify almost any course of human action. When our employer resorts to the Bible to prove that a foreman cannot belong to a union and yet be loyal to his employer, we also, in all reverence, could refer to the same Bible and ask him to explain the passage which specifically states, 'render to Caesar the things that are Caesar's and to God the things that are God's.'

"The Foremen's Association of America is here to stay, because its very foundation rests upon the fundamental principles of justice and fair play. That is why we have been able to withstand the many severe tests to which our organization has been subjected since its founding. We claim that under the wording of the Wagner Act we foremen cannot, and will not, be deprived of our constitutional rights.

"We, too, believe in free enterprise, and no one has yet been able to logically prove that a foreman cannot function efficiently and loyally under the ideal system of free enterprise . . . To listen to some people you would imagine that just because a foreman is a member of our association then he has given up all ambition and individual initiative. Nothing could be further from the truth. It stands to reason that a supervisor who possesses outstanding ability can only develop and prove his capacity, provided he is convinced that he is not being taken advantage of.

"In September, 1943, Guy B. Arthur, industrial relations manager, The American Thread Company, delivered a most interesting address on the subject of foremen, at a meeting of the American Management Association. It was based upon a survey which he had recently made among a large number of supervisors in such diversified industries as steel, glass, food products, textiles, heavy machinery, hardware, paper, and wood products. Here are the results of his survey:

"1. 50 percent said they are definitely unhappy in their present work, and when asked why, 90 percent blamed management.

"2. Despite all that has been written and said about organization charts, 54 percent stated they have no definite lines of authority, 70 percent can count more than one boss. Regarding organization charts, many admit their company has a chart, but said, 'It isn't followed out where the work is done,' or 'too many exceptions to that chart have been made during the recent expansion.'

"How any supervisor can perform his job without a definite line of authority has never been explained, but some managements still expect them to do so.

"3. 54 prcent said their activities were restricted to a degree which handicaps their efforts.

"4. The older foremen recognize the ability of time study specialists, but don't think the question of wages of employees should be handled by others. In addition, they believed that they themselves should be trained to handle grievances, discharges, transfers. Two of those reporting said the worst restrictive force with which they dealt was their personnel department.

"5. 72 percent did not believe they have been or are being properly trained for

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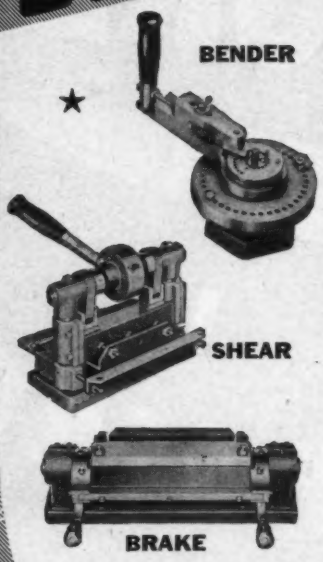

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the jobs they should do. They would like more information and training on individual differences, behaviorism, and personalities.

"6. They want to understand thoroughly all of their company's basic policies, and believe they could be helpful in revising existing policies and establishing new ones. They would like especially to be consulted on the formulation of all policies which affect their employees, since they are closer to these persons than anyone else in the organization. They feel that much employee dissatisfaction could be eliminated if such procedures were adopted.

"7. Many mentioned the restrictions or limitations caused by having their responsibility for doing a particular job nullified by lack of corresponding authority. In many cases, they do not have a clear picture of how far they may go in exercising authority.

"8. Many criticized the ridiculous training programs which management has purchased or developed for them—programs including everything from purchasing to selling.

"9. They desire all management interpretations of each union contract, so that they can educate their people as to what it means and how it works. If a grievance or complaint concerning any of their people is being discussed by a superior, the personnel department, or any step of the grievance procedure, they want to be present, to hear what is said, to air their views, and have first-hand information regarding the disposition of the grievance.

"10. 63 percent reported that they are not being paid proportionately higher wages than their subordinates. In fact, a surprisingly large number pointed out specific cases where individuals working under them are making more than they receive.

"11. The personal objectives of the foremen in the survey were: (a) advancement, (b) financial gain, (c) security, (d) help other people.

"12. The foremen indicated that they have lost confidence in their respective managements.

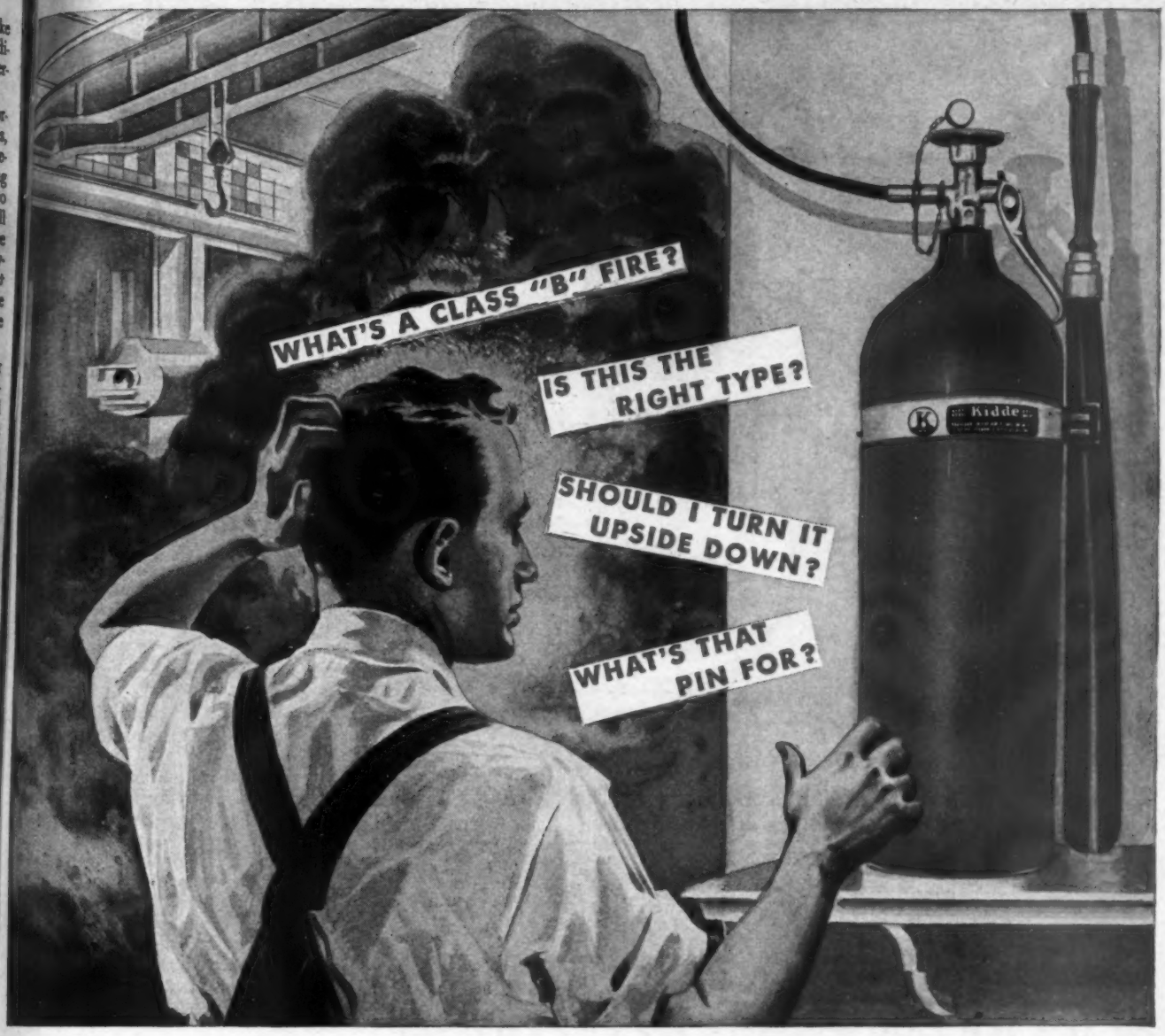
"Arthur then went on to say that if management wants foremen to *act* like part of management, then they should be treated accordingly. A good differential must be maintained between their earnings and those of non-supervisory employees.

"Arthur stated also that the *only* way that management can regain the confidence of the foremen, something that has been lost during recent years, is to give proper recognition to foremen and accept them into the ranks of management.

"There you have the factual results of an honest survey made by a personnel director among many foremen in several different industries. Doesn't it prove our case conclusively? Please remember that the survey was made by one of the executives of top management, not by our association or any group of foremen."

* * *

Differing sharply from the viewpoint of Robert H. Keys, Harry D. Coen, assistant



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to the vice-president in charge of personnel relations, General Motors Corporation, expressed his opinion on the drive to make foremen a part of a mass movement. "I firmly believe," he said, "in a competitive economy, because to my way of thinking the success the United States has achieved and the high standard of living which its citizens enjoy is due to a competitive economy.

"I also believe that there should be added to the Four Freedoms we speak so much about, another freedom—the Freedom of Opportunity, or perhaps it should be called the Freedom of Individual Initiative.

"My concept of a foreman's part in management is the same as that of a general foreman, a superintendent, or a manager—they must be of hardy stock and have what it takes to weather the daily, weekly, monthly, and yearly battles that go with a competitive economy. They must be able to take the bitter with the sweet and to stand up under reverses as well as successes . . .

"The worker, when singled out for promotion to a foremanship, must feel that he has been given the real opportunity of his life. He must feel that he is following in the footsteps of some of the greatest industrial leaders, many of whom have come from the wrong side of the tracks and have forged their way, rung by rung, to the very top of the ladder.

"If he is willing to trade his faith in his ability to get ahead on the basis of his own individual initiative for the lulling influence or the creeping paralysis of mass security on a lower standard of living, he does not have the stuff that it takes. If any part of management has softened up to the point of a willingness to trade mass action for the Freedom of Opportunity that is inherent in a free economy, it is high time that we face the issue and purge management of all such parasitical influence that would tend to weaken and destroy that kind of economy."

* * *

Wage Incentives

Government wage controls and wartime costs and taxes make a true wage incentive application the only way that workers can make more money in accordance with the effort he spends, and still not increase unit costs, in the opinion of John F. Campbell, plant manager, International Projector Corporation. Furthermore, Campbell does not believe that there is a business, industry, or product in existence where a satisfactory wage incentive system cannot be applied. "Perhaps full coverage may not be possible," he said, "because of quantity or some other controlling factor, but certainly a good part of output is measurable."

"I think it well to state," he concluded, "that, in my opinion, entirely too much emphasis is placed on the increased earning possibilities introduced by wage incentives applications. Much too little emphasis is given to other very valuable uses, such as production control and machine loading, cost control, revelation of excesses, estimating, determination of indirect to direct ratios, determination of

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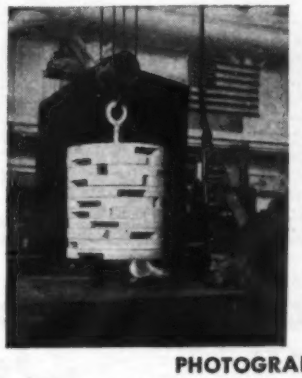

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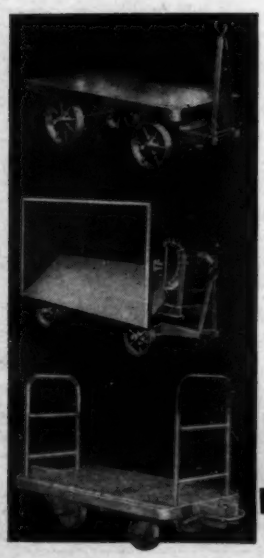

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individual efficiency, and complete labor analysis. Right now a particularly pertinent fact is that a good system will provide rapid and accurate means for presenting claims when cancellation occurs on war contracts."

* * *

Industry's Duty to War Handicapped

Both present manpower shortages and industry's duty to those who return from the war with physical and mental handicaps demand that industry advance its thinking with respect to the employment of handicapped people, according to Dr. Harold A. Vonachen, general medical director, Caterpillar Tractor Company.

For two years Caterpillar has been placing the physically handicapped in its plants. It is interesting to note that the safety, absentee, and production records of the handicapped are, in most cases, better than average. "Based on their experience with the physically handicapped," said Vonachen, "supervisors are eager to have additional such employees in their departments."

Caterpillar's experience has led to the formation in the community of a Greater Peoria Rehabilitation Council in which are included representatives of industries, farm bureaus, labor unions, retail stores, American Legion, churches, and other state, county, and city organizations. "In adopting wholeheartedly an intensive placement of the physically handicapped," Vonachen concluded, "industry is not only meeting its own present necessities. It is also greatly aiding the handicapped individuals who, after being properly placed, are shown no special consideration, ask no charity, and are paid at the same rates as unhandicapped individuals. By giving these people the opportunity to prove their usefulness and capacity for self-support, industry is benefitting the community, the war effort, and society generally."

•

Factory Management and Maintenance is a consolidation of *Factory and Industrial Management* and *Maintenance Engineering.*

Factory and Industrial Management grew from consolidations, mergers, or absorptions involving the following publications: *The Engineering Magazine; Industrial Management; Factory, the Magazine of Management; Management Engineering; Administration; Management and Administration; Management and Administration in Manufacturing Industries; Manufacturing Industries.*

Maintenance Engineering grew from consolidations, mergers, or absorptions involving the following publications: *Review of the Telephone and Telegraph; Electrical Review; Western Electrician; Electrocraft; Electrical Engineering; Electrical Review and Industrial Engineer; Industrial Engineer; Industrial Engineering; Industry Illustrated.*

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Get the inside facts and you'll see why Industry prefers Worthington "Feather* Valve" Compressors over other makes

Huskier, *heavier* — 30 to 300% heavier, size for size, price for price — all Worthington "Feather* Valve" Verticals have the same rugged qualities as the big Worthington Air Compressors. "Feather* Valve" Radials have such special service-stretching features as airplane-type connecting rods and non-stop forced-feed lubrication. And both types have the famous trouble-free "Feather* Valve".

You may need air power for any one of a hundred uses, but this much is sure: the extra weight, the better valves, the more efficient lubrication of Worthington "Feather* Valve" Compressors can save you downtime, maintenance costs, and add years to compressor life in your plant. Investigate, call our nearest District Office or Authorized Industrial Dealer. You, too, will get *more* air, more *worth,* from air — with Worthington!

*REG. U. S. PAT. OFF.

Vertical and Radial Air Compressors, in hundreds of combinations from 20 to 2000 lbs. pressure, delivering 1 to 360 c.f.m. — in mountings to suit all jobs — Industry's first choice.

"FEATHER* VALVE" MAKES BREATHING EASY

The "Feather* Valve" is the lightest, most efficient valve in use, simple in construction and operation . . . opens and closes by easy flexing . . . too light to develop destructive inertia . . . too flexible to warp. Simple . . . Foolproof . . . Dependable . . . Assures satisfying service and performance plus.

Standard Products Division
WORTHINGTON PUMP AND MACHINERY CORPORATION
Harrison, New Jersey

YOUR MONEY'S WORTH
WORTHINGTON

AC 6-2

THEY CAN'T THROW A *Monkey Wrench* INTO YOUR R&M Uni-Shell DIRECT CURRENT MOTORS

Unusual degree of protection against motor damage offered by end head design that guards against falling chips, plaster, dust, liquids . . . everything!

In line with the modern trend toward a more protected type of motor, the new Robbins & Myers Uni-Shell Direct Current Motors combine a high degree of mechanical protection with ease of commutator and brush inspection. They are completely modern in mechanical construction and electrical performance. All types, whether shunt or compound-wound, are designed with interpoles, assuring long, trouble-free operating life, with good commutation and the minimum of brush and commutator wear.

In addition, you can enjoy the benefits of flexible mounting provided by Uni-Shell interchangeability. For shell length, diameter, base mounting holes, shaft dimensions, height of shaft above base, head fit, and bolt circle mounting for heads are exactly the same on these d. c. motors as on the a. c. types.

Get all the facts on profitable d. c. motor application by asking for your free copy of the new, helpful, 20-page R & M Uni-Shell Motor booklet, today. Also, talk to a representative, if you like.

SHIPMENT NOW!

Ample stock on all types of integral motors on hand as this goes to press. Wire or phone your inquiry.

ROBBINS & MYERS • INC.

MOTOR DIVISION, SPRINGFIELD, OHIO

HOISTS & CRANES • MACHINE DRIVES • FANS • MOYNO PUMPS • FOUNDED 1878

Mail This Coupon, Now!

ROBBINS & MYERS, INC., Motor Division, Springfield, Ohio FM 10

Please send my free copy of the new, informative Uni-Shell Motors booklet.

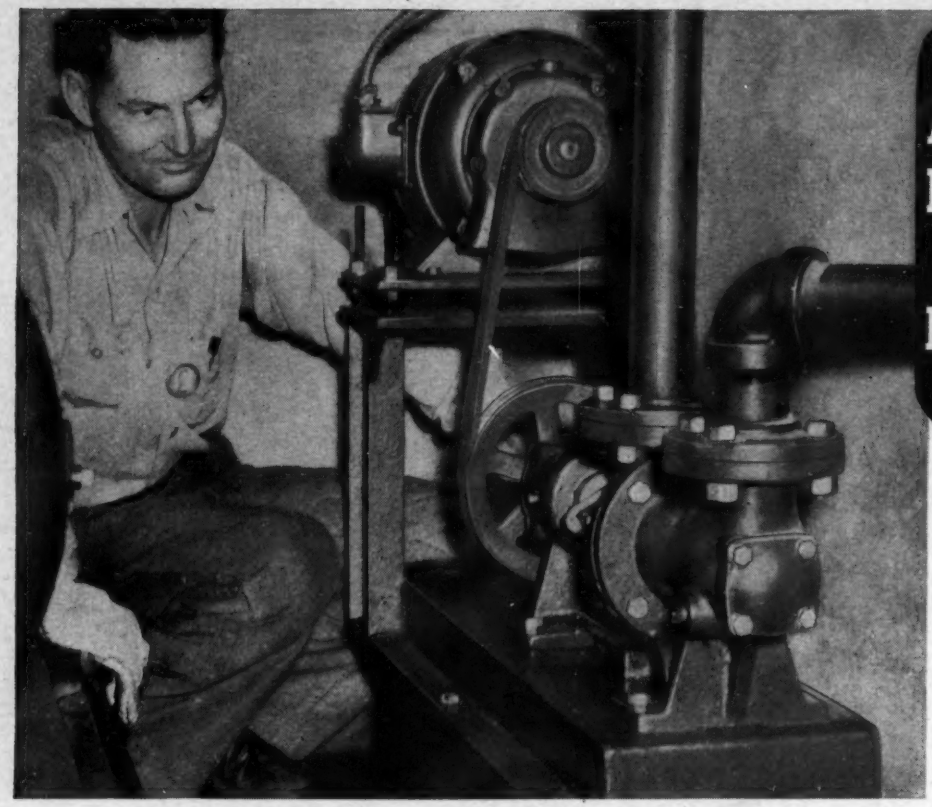
Name.....*Dept.*.....

Company.....

Address.....

City.....*State*.....

I would ☐ would not ☐ like to talk to a representative.



SCALE and ABRASIVES NO PROBLEM with MOYNO PUMPS

says K. E. Brodbeck

SUCTION LIFTS OIL LOADED WITH ABRASIVES . . .

Mounted in basement of heat treat building of Bauer Bros., this Moyno Frame B4 Pump is suction-lifting oil, drained from quench tanks. This sludge is loaded with scale and abrasives. Another Moyno Pump on main floor performs same duty except it suction-lifts sludge much higher.

. . . "THESE SIMPLE LITTLE PUMPS WE CONSIDER BETTER FOR THIS SERVICE THAN CONVENTIONAL ROTARY OR CENTRIFUGAL PUMPS, WHICH EITHER WEAR OUT RAPIDLY OR HAVE SUCTION TROUBLES."

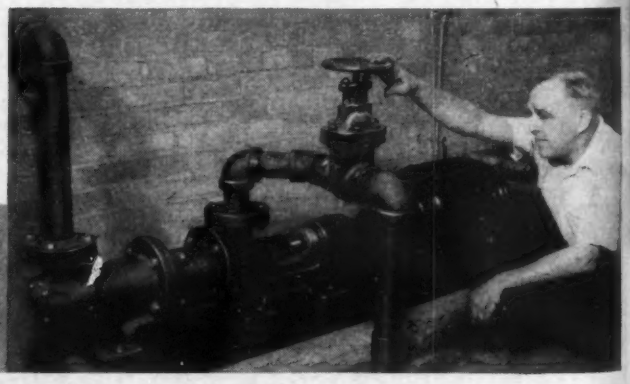
Conclusive pump evidence for production men is the above statement by K. E. Brodbeck, Manager Ordnance Division, The Bauer Brothers Co., Springfield, Ohio.

Three Robbins & Myers Moyno Pumps were installed by his company a year and a half ago and to date, to further quote Mr. Brodbeck, "We have had no service expense."

AND HERE'S THE REASON . . .

With no pistons and no valves to wear, Moyno Pumps handle abrasive material without trouble. Cavitation and pulsation are eliminated because the exclusive Moyno principle, *only one moving part,* produces a flow that is constant and uniform. And they pump virtually all fluids or semi-liquids, such as: molten resin, vitreous enamel, glucose, gun-boring coolants, propane gas, liquid carbon dioxide. Also Moyno Pumps are so simple in design that one can be dismantled and reassembled in 30 minutes. And being extremely mobile they are valuable auxiliaries in pumping emergencies.

Have you a pump problem? Then allow us to propose a solution as we did for The Bauer Brothers Co.



TRANSFERS QUENCHING OIL. This Moyno Frame B6-6 Pump transfers quench oil from tank car to storage tanks. "Not so difficult a job as sludge pumping but our B6-6 always performs when called on," says Mr. Brodbeck.

ONLY 1 MOVING PART!

Here's the patented principle of the R & M Moyno Pump's amazing performance. A single-threaded helical rotor revolves within a double-threaded helical stator, providing pumping action like that of a piston moving through a cylinder of infinite length.

ROBBINS & MYERS • Inc.

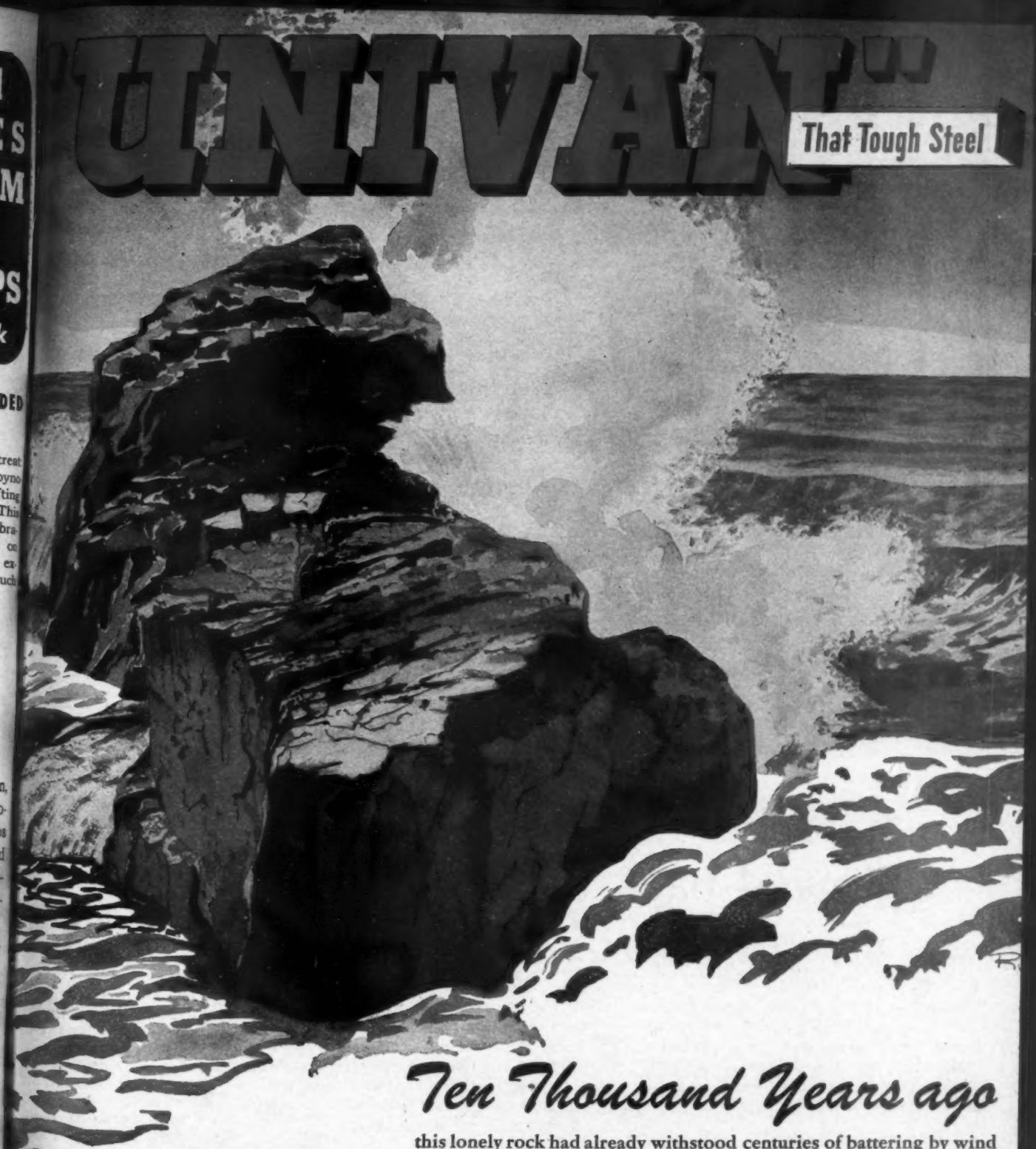
MOYNO PUMP DIVISION — SPRINGFIELD, OHIO

In Canada: Robbins & Myers Co. — of Canada, Ltd., Brantford, Ont.

HOISTS • CRANES • MOTORS • MACHINE DRIVES • FANS • FOUNDED 1878

"UNIVAN"

That Tough Steel



Ten Thousand Years ago

this lonely rock had already withstood centuries of battering by wind and wave. Still there today, it stands as a permanent symbol of rugged toughness. In steels you'll find that same toughness in "UNIVAN" — a high grade cast steel scientifically heat-treated. Its unusual strength plus exceptional shock-resisting qualities make it ideal for parts which must stand up under heavy shocks and severe stresses. "UNIVAN" and Union's long experience in Fabricasting intricate jobs can assist you materially by eliminating expensive repairs and loss of time due to breakdowns.

ARMY E NAVY

For Long Life with Economy
Specify "UNIVAN"—*that Tough Steel*

UNION STEEL CASTINGS

DIVISION O
BLAW-KNOX C
PITTSBURGH, P

MAKERS OF Driving Wheel Centers, Locomotive Frames, Pump Casings, Vault Doors and Frames, Annealing Boxes, Spindle
Coupling Boxes, Open Hearth Charging Boxes, Gear Blanks — and other Castings for Steel Mills and General Industr

More than a quarter million dollars plowed back to American industry

by One Allen Ventilating Unit . . .

Ventilation that does the job comes first with Allen. Close on the heels of that consideration comes lowered cost to the buyer. Only when we click on both are we satisfied, because only then do we know we've done the right kind of job.

Basically better ventilation engineering has enabled Allen to furnish industry with more than four thousand Allen Type "H" Roof Fans at an average saving of $62.50 per unit over the nearest comparable equipment—more than a quarter million dollars.

The explanation is simple. Allen patents cover the use of dampers balanced in the effluent air stream—open when the fan is running, closed automatically when power is off. This is in contrast to construction used by several other manufacturers wherein mechanical, motor-operated dampers are mandatory and up the cost.

Approximately 400 of these Allen units top the huge Willow Run Bomber Plant, shown above. Allen has an answer for your ventilation problem, too, whether it's ordinary or extraordinary. Let's talk it over. *The Allen Corporation, 9751 Erwin Avenue, Detroit 13, Michigan.*

SOME TYPICAL USERS OF ALLEN TYPE "H" UNITS

BLACK AND DECKER
BOWER ROLLER BEARING
BUNDY TUBING COMPANY
EX-CELL-O CORPORATION
FISHER BODY DIVISION
FORD MOTOR COMPANY
GENERAL ELECTRIC COMPANY
DES MOINES ORDNANCE PLANT
TWIN CITIES ORDNANCE PLANT
LOWELL ORDNANCE PLANT
ACME COTTON PRODUCTS
KEN-RAD CORPORATION
BROOKLYN NAVY YARD
MINNEAPOLIS ORDNANCE PLANT
SERVEL, INCORPORATED
A. C. SPARK PLUG
GAR WOOD INDUSTRIES

THE *Allen* CORPORATION

ENGINEERED VENTILATION FOR INDUSTRY

Why the **MP** *in this* *POWELL VALVE ad?*

Well—you know what "Military Police" signifies, don't you? It's the designation of specially qualified, specially fitted men who are charged with the duty of seeing that "things run smoothly." One of their most important functions, wherever troops and supplies are located, is to *control the flow* of traffic.

So—that "M P" is in this advertisement because he signifies the thorough-going job performed by POWELL VALVES in every branch of industry—in *controlling the flow* of liquids and gases—often under the most exacting conditions.

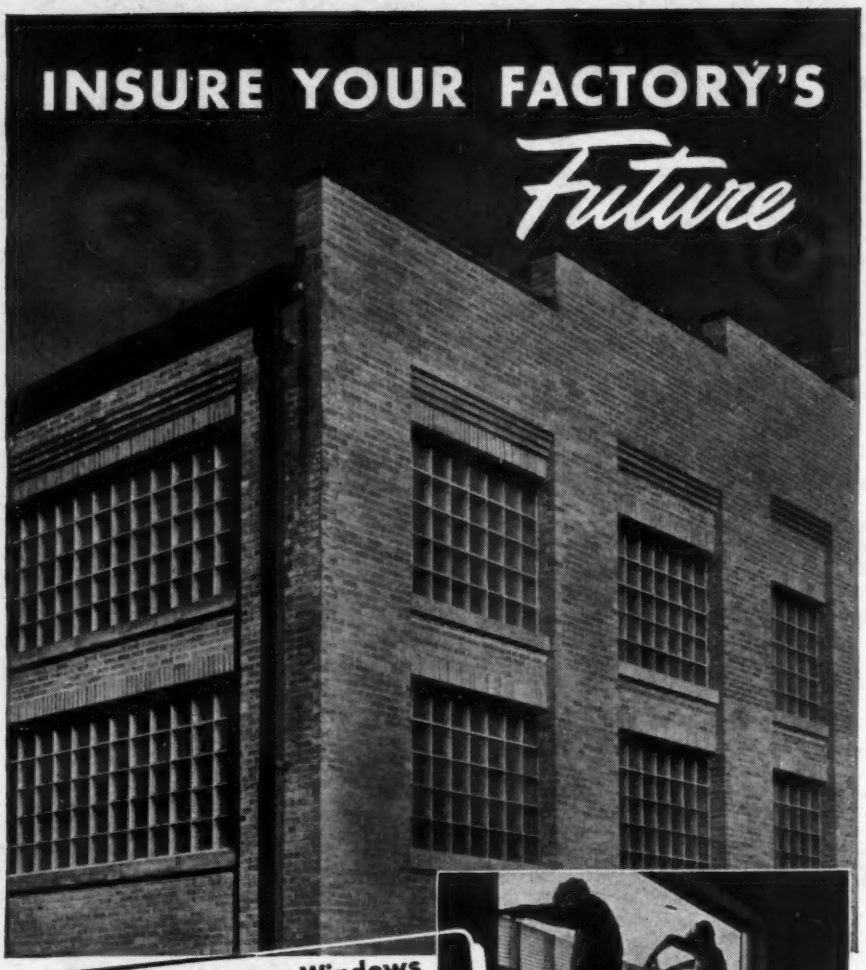
The Wm. Powell Co.
Dependable Valves Since 1846
Cincinnati 22, Ohio

Fig. 150—Bronze "Union Disc" Globe Valve for 150 pounds W.P. Screwed ends, union bonnet, and renewable vulcanized composition disc—especially adapted for throttling service—for the control of low-pressure steam, oil, water, gas, etc.

Fig. 500—125-pound Bronze Gate Valve with screwed ends and screwed-in bonnet. Sizes ¼" to ¾" equipped with taper wedge solid disc; sizes 1" to 3" with taper wedge double disc.

POWELL VALVES

INSURE YOUR FACTORY'S *Future*



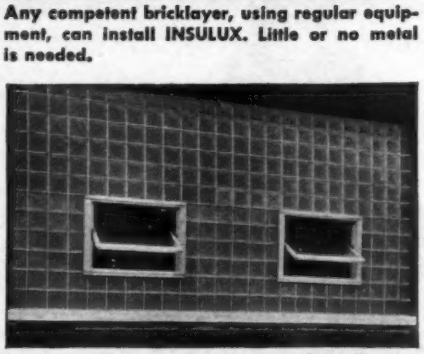
Replace Worn-Out Windows Now With INSULUX Glass Block

Any competent bricklayer, using regular equipment, can install INSULUX. Little or no metal is needed.

During these war years, thousands of factories are replacing worn-out windows with INSULUX Glass Block. INSULUX is readily available at economical prewar prices. No critical materials are needed.

But availability isn't the sole advantage of INSULUX today. INSULUX Glass Block flood plants with diffused, evenly-distributed daylight. High insulation value saves fuel, helps control temperatures and humidity the year 'round. INSULUX seals out dust, dirt, and moisture. INSULUX is fireproof—noncombustible.

Tomorrow's industrial architecture will make good use of the better lighting, savings, and efficiency of INSULUX. A sash replacement program with INSULUX, started today, assures your plant of a long-term lease on the future.



When ventilation and vision are desired, windows can be easily built into INSULUX panels. All materials are immediately available.

OWENS-ILLINOIS
INSULUX
GLASS BLOCK

A FREE BOOK TO ANSWER WINDOW REPLACEMENT PROBLEMS

"Methods of Replacing Worn-out Windows with INSULUX" is a new 24-page book, filled with photographs and details showing how easy it is to remodel with INSULUX. Write for your copy today.

Owens-Illinois Glass Company, INSULUX Products Division, Dept. 108 Toledo, Ohio.

BOOKS

1021 ANSWERS TO INDUSTRIAL HEALTH AND SAFETY PROBLEMS

Edited by Jack E. Weiss, editor, "Occupational Hazards Magazine." Occupational Hazards, Inc., 812 Huron Rd., Cleveland, 699 pages plus 112-page "Equipment Index." Photographs, drawings, tables, index. $10.

As title implies, book is in question-and-answer form, and covers various hazards found in industry. Section headings include "The What and Why of Industrial Skin Diseases," "Dust Hazards," "Metal Poisoning," "Toxic Gases and Vapors," "Solvents," "Miscellaneous Exposures," "Controls for Air-Borne Industrial Hazards," "Safety Administration," "Personal Protective Equipment," "Mechanical Safety," "Tool Protection," "Plant Safety." Also included are sample forms for record keeping, classification of potential hazards by chief industries, and classification of potential hazards by occupation.

THE DESIGN OF MANUFACTURING ENTERPRISES

Walter Rautenstrauch, LL.D., Department of Industrial Engineering, Columbia University. Pitman Publishing Corp., 2 W. 45th St., New York 19. 298 pages. Layouts, drawings, tables, charts, index. $3.50.

Efficient, economical design is important to the profitable operation of both small and large manufacturing businesses. This book sets forth methods of design that improve operating characteristics. In two parts, "The Business as a Whole," including chapters on the nature and the elements of the problem, principles and methods of procedure, design of new and old businesses, and others; and "Selected Problems."

OCCUPATIONAL RATING PLAN

Industrial Management Society, 205 W. Wacker Drive, Chicago. 232 pages. Tables, charts, index. $2.50.

Book for evaluating manual or shop occupations, pointing out all the factors that must be considered. Chapters on converting rating points to money, designing the conversion scale are included, as well as examples of evaluation, and the evaluation of 50 key jobs.

BETTER INDUSTRIAL RELATIONS FOR VICTORY

Proceedings of the Twenty-Sixth Silver Bay Industrial Conference. National Council of the YMCA's, 347 Madison Ave., New York. 140 pages. $1.

Reports of addresses and discussions at sectional conferences at the 1943 Silver Bay Conference, at which men and women prominent in the field of industrial relations told of their experiences and propounded theories on training, women in industry, absenteeism, and other problems.

WHERE'S THE MONEY COMING FROM?

Stuart Chase. Twentieth Century Fund, 330 W. 42nd St., New York. 179 pages. $1.

Number 3 in the series of "guidelines to America's future" under the title of "When the War Ends." Although we know that when the war is over America will have the resources, the plant, and the manpower for an age of abundance, the author asks, "Where's

IT'S GOOD

for what ails them

You can't walk around your plant like a doctor with a thermometer, but unless you have modernized recently with temperature controls, many of your process operations are below par in output, and wasting heat or cooling water at the same time.

Sarco controls are simple, inexpensive, and easy to install. They are positive in action, time tested, and built in a modern plant devoted exclusively to steam traps and temperature controls.

Industrial temperatures are vital to the all-out production effort now. They will be vital for survival in the post-war competitive economy as well. The time to get your plant operations temperature-perfect is now. Our nearest representative will tell you how.

SARCO
Saves Steam

SARCO COMPANY, INC.
475 FIFTH AVE. NEW YORK 17, N. Y.

SARCO CANADA, LTD.,
35 Richmond Street, West, TORONTO, ONTARIO

Represented in Principal Cities

SARCO TEMPERATURE CONTROL

Rx

SIMPLE PRESCRIPTIONS

1

The Sarco TR-40 for cooling control of engine or compressor jackets, condensers and stills will save up to 50% of the water now used. Catalog No. 700.

2

The Sarco No. 87 liquid expansion steam trap for outdoor service, also used as control for process equipment and tanks heated by steam coils. Catalog Nos. 250 and 550.

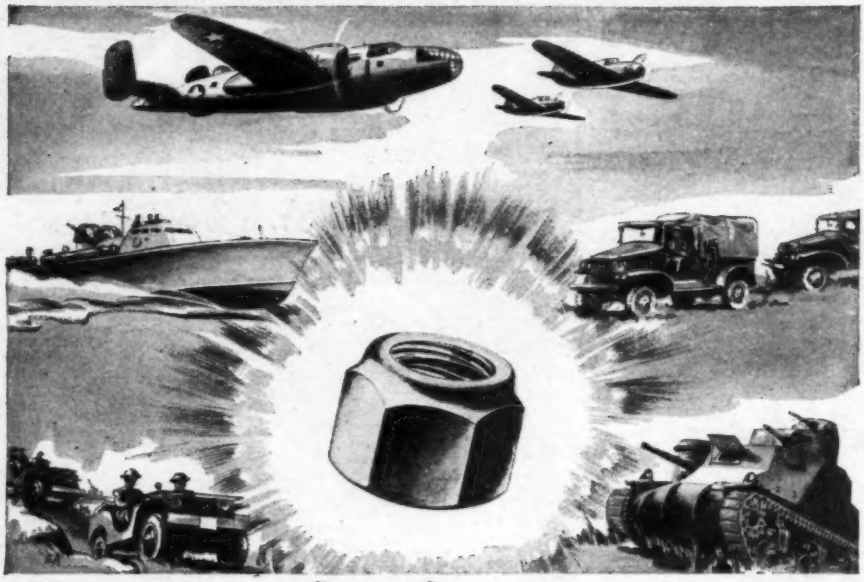
3

The Sarco type TR-21 temperature regulator, liquid expansion, positive operation, packless valves, for hot water and process operations. Catalog No. 600.

4

Sarco Electric Control: room thermostats, limit controls, aquastats, immersion types, and motor valves for heating, air conditioning and industrial applications. Catalog Nos. 1025 and 1050.

2



PUTTING A NEW "HEX" ON PRODUCTION PROBLEMS

The ROL-TOP "hex" nut is a new application of the Boots principle of self-locking nuts which assure vibration-proof connections.

Because of the recognized efficiency of the ROL-TOP, design engineers are specifying it for application wherever self-locking devices are desirable.

Specially planned and built for heavy duty, the ROL-TOP Nut resists heat, air, gasoline and other destructive elements which make ordinary non-metallic devices inapplicable.

Boots one-piece, all-metal, self-locking nuts pass all government requirements.

SEND FOR CATALOGUE

BOOTS

BOOTS AIRCRAFT NUT CORPORATION ★ GENERAL OFFICES, NEW CANAAN, CONNECTICUT

DOUBLE the Cutting Life of Your Saws!

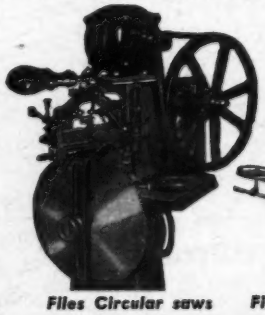
Why do saws break out teeth, crack, or lose their temper? Nine times out of ten it is because they are used when too dull or imperfectly filed. Then they get too hot,—and the trouble starts.

With Foley *Automatic* Saw Filing, your saws can be filed so much faster that you can always work with sharp saws, which not only prolongs saw life but increases power saw output from 25% to 40%. Also—your saws will be *automatically* jointed as they are Foley-filed, keeping all teeth even in size, shape, spacing. Foley-filed saws run so smooth, true and cool that breakage is practically eliminated. If your saws are hand-filed,—investigate the many advantages of Foley-filed saws.

ONE MACHINE FILES ALL SAWS

The Foley Automatic Saw Filer is the ONLY machine that files crosscut circular saws 3" to 24" in diameter, band saws up to 4½" wide,—all hand saws. Simple attachments come with the machine for each type of saw. A Foley Automatic Saw Filer can be purchased under a CMP - 5 - MRO. Prompt delivery can be made.

Files Hand saws



Files Circular saws

30-DAY TRIAL IN YOUR OWN PLANT

Although thousands of Foley Filers have been in use for years by factories, plants, mills, government departments, etc., you may have the privilege of a 30-day trial in your own shop, on your own work. Actual use of Foley-filed saws is more convincing than anything we can say.

Files Band saws

FOLEY *Automatic* SAW FILER

FOLEY MFG. CO., 45 2nd St. N.E., Minneapolis 13, Minnesota

Please send literature on the Foley Automatic Saw Filer and details of your 30-Day Trial

Name .....

Address .....

the money coming from?" and then explains the way out, the realities behind the dollars and the debts, and the means which exists for controlling our economic future.

SWEET'S FILE FOR PRODUCT DESIGNERS

Sweet's Catalog Service, 119 W. 40th St., New York. 1540 pages. Distributed free to qualified users.

File of catalogs containing information on the products and services of 195 companies, covering materials, finishes, techniques, parts, work equipment.

BOOKLETS

SETTLING PLANT GRIEVANCES. A review of grievance procedure under collective bargaining. Bulletin No. 60. United States Department of Labor, Division of Labor Standards, Washington, D. C. 47 pages. Forms. No charge.

LIGHTING HANDBOOK. Westinghouse Lamp Division, Westinghouse Electric & Mfg. Co., E. Pittsburgh. 175 pages. Drawings, charts, forms, tables. $1.

MANPOWER MOBILIZATION FOR PEACE. International Labour Office, 3480 University St., Montreal, Canada. 78 pages. 25c.

POST-WAR PLANNING NOW. Selected post-war excerpts of factual industry plans. The Journal of Commerce, 65 Park Row, New York 15. 24 pages, tabloid size. 25c.

ON THE CALENDAR

JANUARY

10–14, Society of Automotive Engineers, Annual Meeting, Book Cadillac Hotel, Detroit, John A. C. Warner, Secretary and General Manager, 29 West 39th St., New York.

24–28, American Institute of Electrical Engineers, Winter National Technical Meeting, H. H. Henline, Secretary, 29 West 39th Street, New York.

31–Feb. 2, American Society of Heating and Ventilating Engineers, 50th Annual Meeting, Hotel Pennsylvania. New York. A. V. Hutchinson, Secretary, 51 Madison Ave., New York.

FEBRUARY

9–11, American Management Association, Personnel Conference, Palmer House, Chicago. Henry J. Howlett, Secretary, 330 West 42nd St., New York.

MARCH

26–28, American Society of Tool Engineers, Annual Meeting, Philadelphia. Adrian L. Potter, Executive Secretary, 2567 West Grand Blvd., Detroit.

28–30, Safety Engineers, Annual Convention, Hotel Pennsylvania, New York, Paul F. Stricker, Executive Vice-President, Greater New York Safety Council, Lincoln Building, 60 East 42nd St., New York.

28–31, American Management Association, Packaging Conference, Palmer House, Chicago. Henry J. Howlett, Conference Manager, 330 W. 42nd Street, New York.

At your Service FAST!

3200 man-hours of Willson Safety Service daily; 400 men circulating in practically every industrial center from one coast to the other—that's the unique Willson Safety Service set-up! These men are in daily contact with eye-protective and respiratory problems. Each has the benefit of the 73 years of Willson experience in serving every branch of industry.

Some Willson products are now available without priority, others still require priorities but you'll need no priority to take advantage of the help and advice your local Willson Safety Service Representative can give you. Call him in whenever you have a problem. He's no farther away than your phone.

ATLANTA—Fulton Supply Co.
BALTIMORE—Corey Mach. & Sup. Co.
BIRMINGHAM—National Cyl. Gas Co.
BUFFALO—American Allsafe Co.
CAMBRIDGE, MASS.—
Cutter, Wood & Sanderson Co.
CHARLESTON, S. C.—
Cameron & Barkley Co.
CHARLESTON, W. VA.—
Safety First Supply Co.
CHATTANOOGA—C. D. Genter Co.
CHICAGO—Protective Equipment, Inc.
CINCINNATI—The E. A. Kinsey Co.
CLEVELAND—
Safety Clothing & Equipment Co.
COLUMBUS, O.—The E. A. Kinsey Co.
DAYTON—The E. A. Kinsey Co.
DENVER, COLO.—E. D. Bullard Co.
DETROIT—Willson Products, Inc.
GRAND RAPIDS—F. Raniville Co.
GREENSBORO, N. C.—
Smith-Courtney Co.
GREENVILLE, S. C.—Carolina Sup. Co.
HICKORY, N. C.—Smith-Courtney Co.
HONOLULU AND HILO—
Theo. H. Davies & Co., Ltd.
HOUSTON—E. D. Bullard Co.
INDIANAPOLIS—The E. A. Kinsey Co.
JACKSON, MISS.—
National Cylinder Gas Co.
JACKSONVILLE—
Cameron & Barkley Co.
KANSAS CITY—L. R. Stone Supply Co.
LOS ANGELES—E. D. Bullard Co.
LOUISVILLE—Neill-La Vielle Co., Inc.
MEMPHIS—National Cylinder Gas Co.
MILWAUKEE—Protective Equip., Inc.
MUSKEGON—Factory Supply Co.
NEW ORLEANS—
Woodward, Wight & Co., Ltd.
NEW YORK—W. S. Wilson Corp.
OKLAHOMA CITY—
Hart Industrial Supply Co.
OMAHA—Interstate Mach. & Sup. Co.
PHILADELPHIA—Industrial Prod. Co.
PITTSBURGH—Safety First Supply Co.
PROVIDENCE—James E. Tierney
RICHMOND, VA.—Smith-Courtney Co.
SAVANNAH, GA.—Natl. Cyl. Gas Co.
ST. LOUIS—Silge Iron Store Co.
ST. PAUL—Farwell, Ozmun, Kirk & Co.
SALT LAKE CITY—E. D. Bullard Co.
SAN FRANCISCO—E. D. Bullard Co.
SCRANTON—L. B. Potter Co.
SEATTLE—E. D. Bullard Co.
SYRACUSE—Syracuse Supply Co.
TAMPA—Cameron & Barkley Co.
TROY, N. Y.—The Troy Belt & Sup. Co.
TULSA, OKLA.—Hart Ind. Supply Co.

CANADA

TORONTO—Safety Supply Co.
MONTREAL—Safety Supply Co.
VANCOUVER—Safety Supply Co.

GOGGLES • RESPIRATORS • GAS MASKS • HELMETS

DOUBLE WILLSON
PRODUCTS INCORPORATED
READING, PA., U.S.A. *Established 1870*

WHAT MAKES A LOOSEN?

WHAT MAKES A BACK OUT?

IT'S VIBRATION!

PROTECT EVERY CONNECTION WITH

SHAKEPROOF

LOCK WASHERS

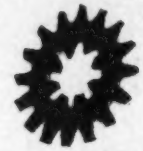
"THE STANDARD OF LOCKING EFFICIENCY!"

Each tapered twisted tooth bites into both surfaces . . . producing powerful strut action lock. Better product performance assured!

Free Test Kit! Write!

EXTERNAL TYPE

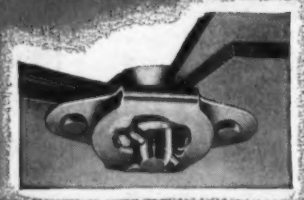
INTERNAL TYPE



EXTERNAL-INTERNAL TYPE

GOOD DESIGN DEMANDS MODERN FASTENINGS!

Semi Fastener Units
Pre-assembled Shakeproof



Shakeproof Cowl Fasteners

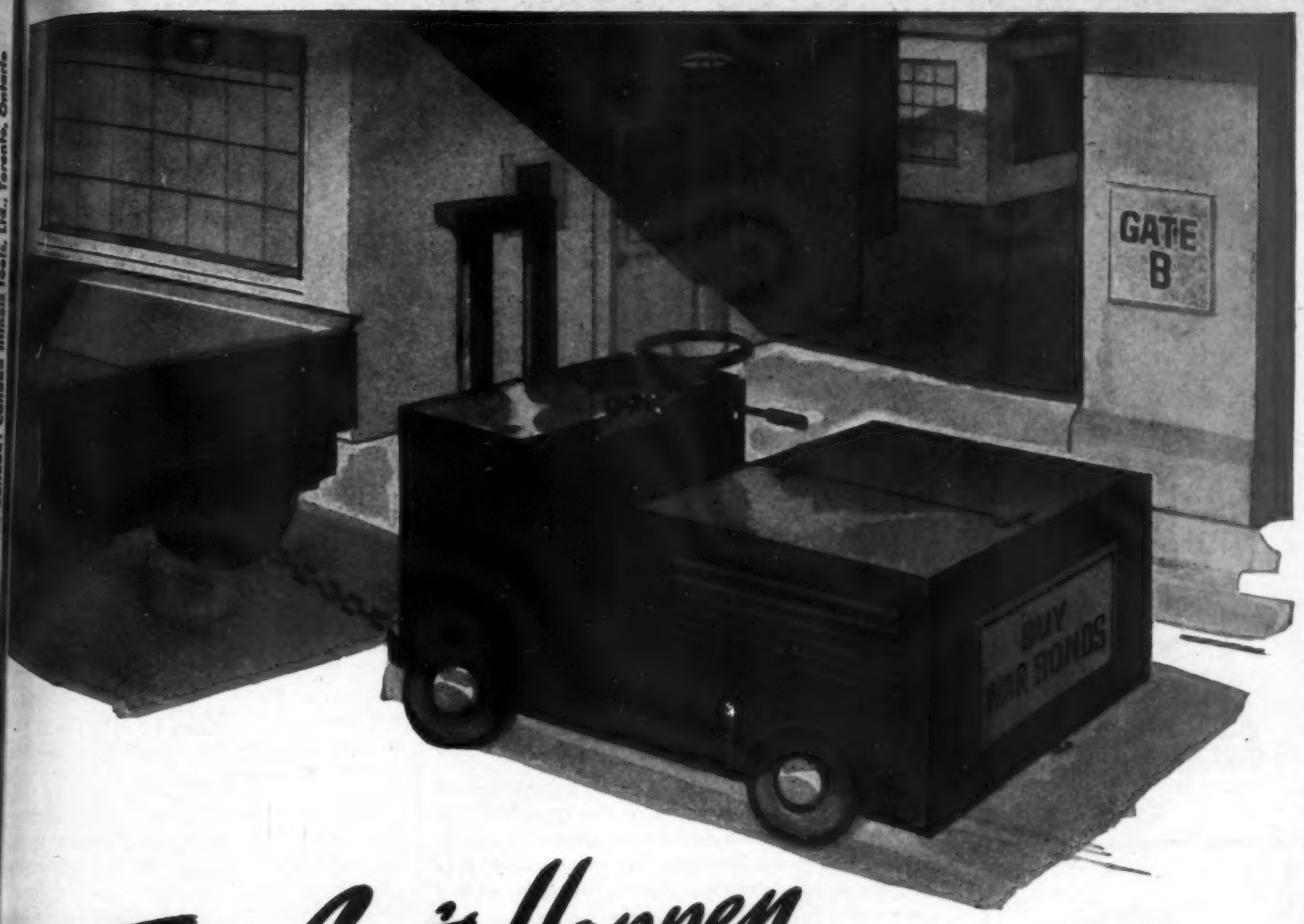
Shakeproof Thread-cutting Screws
Type 1 for metals

SHAKEPROOF Inc.

"Fastening Headquarters"

Distributor of Shakeproof Products Manufactured by ILLINOIS TOOL WORKS
2501 North Keeler Avenue, Chicago 39, Illinois
Plants at Chicago and Elgin, Illinois In Canada: Canada Illinois Tools, Ltd., Toronto, Ontario

Distributor of Shakeproof Products Manufactured by ILLINOIS TOOL WORKS
2501 North Keeler Avenue, Chicago 39, Illinois
Plants in Chicago and Elgin, Illinois; in Canada, Canada Illinois Tools, Ltd., Toronto, Ontario



This Can't Happen

WHEN YOU USE G-E BATTERY CHARGERS

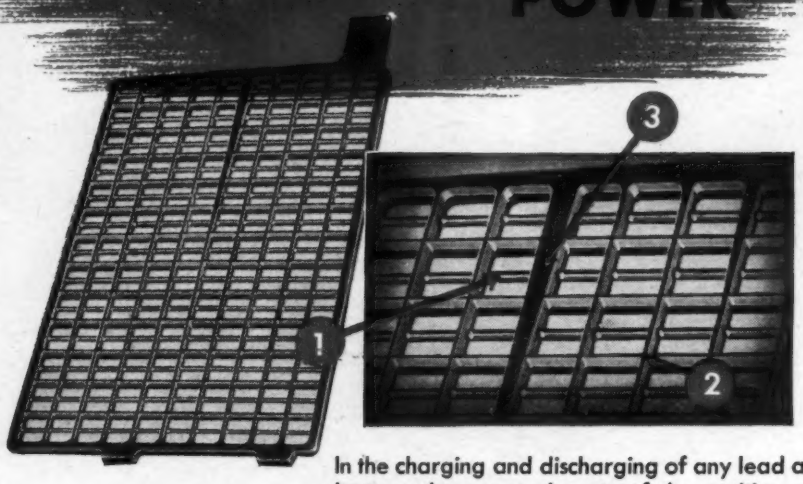
Long hauls or a hard day's work will often leave the battery of an electric truck run down. That's understandable. Inexcusable and unnecessary is the waste of precious manpower, material and time in "shipping" them back to a central charging station. They can be recharged *on the spot* by G-E battery-charging rectifiers placed at strategic locations so they're always on the job. Further, they are fully automatic, require no special training to operate. Just plug in and the charger does *everything else.*

Detailed data sent on request. Write to Section A143-37, Appliance and Merchandise Dept., General Electric Co., Bridgeport, Conn.

GENERAL ELECTRIC

Call Gould
TO SOLVE YOUR BATTERY PROBLEMS

GOULD GRIDS Sustain POWER



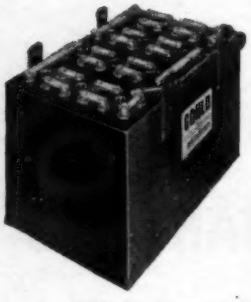
In the charging and discharging of any lead acid battery the exposed parts of the positive grid tend to become oxidized by its electro-chemical action. This peroxidization, as it is called, frequently weakens the member to the point where premature failure takes place.

To reduce this hazard and create a grid equal in all respects to the performance of Gould's long-lived positive active material, Gould engineers have designed a new Kathanode grid with a number of outstanding improvements.

These are: (1) a core member buried beneath active material and thus safe from the weakening effects of peroxidization; (2) a box structure that holds in four directions, locking active material in place, preserving life and assuring conductivity; and (3) an enlarged cross-section at top of important vertical members for adequate conductivity under heavy loads.

This new Kathanode grid is an outstanding storage battery development and another factor that provides Gould users with high sustained capacity throughout a longer battery life.

Get the facts on Gould Batteries. Ask for the Gould Kathanode Bulletin, using your business letterhead.



Rated Conservatively . . . Goulds equal or exceed in capacity any battery of comparable size and cell structure.

Are you receiving the monthly, informative "*Gould Battery News*"? If not . . . ask for it.

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FOR EXCELLENCE IN STORAGE BATTERY PRODUCTION AT DEPEW PLANT

GOULD

Since 1898 THE BATTERY PICKED BY ENGINEERS

SPECIFIC GRAVITY

One of a series of service suggestions for users of industrial batteries.

▶ Specific gravity is the weight of a solution compared to an equal volume of pure water. On this scale pure water is one. Concentrated sulphuric acid normally has a specific gravity of around 1.835. Added to water it increases the weight of the solution in direct proportion to the amount of acid present.

For example, in a fully charged industrial truck battery, in good condition, this specific gravity reading is around 1.280, or 1.28 times as heavy as pure water . . . an arbitrary ratio of acid and water that has been found by research and experiment to be the most efficient for this purpose. When this same battery is in a discharged condition it will have a much lower specific gravity, for its electrolyte will contain less acid.

The reason for this difference is that the discharge of a battery is essentially a chemical reaction whereby acid from the electrolyte combines with the oxides in the plates to form lead sulphate. As this sulphate is created more and more acid is taken from the solution and that reduces its specific gravity. Charging operations reverse this action, driving the acid from the plates and back into the electrolyte. From this it is easy to see that a specific gravity reading, the ratio of the acid to water, is an accurate measure of a battery's state of charge.

The use of a well designed hydrometer is the most convenient, and reasonably accurate means of ascertaining specific gravity. These hydrometers come in many styles and, in some cases, are built into the battery. For portable batteries, however, the commonest form is a syringe type that draws off a portion of the electrolyte into a glass tube containing the hydrometer.

The best of these hydrometers are accurate instruments. For reading they should be held so the eye is level with the surface of the liquid and the curvature due to surface tension disregarded. This is necessary because slight differences in the specific gravities of fully charged batteries can be an indication of trouble.

Interested persons may receive full information by writing the Service Department, Gould Storage Battery Corporation, Depew, New York.

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Here's the "Doctor"

to cure Production Wastes!

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Here are just a few of the temperature points where use of Foxboro Temperature Recorders may point out important savings:

BOILER ROOM EQUIPMENT

DRYERS STORAGE ROOMS

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Unsuspected temperature fluctuations may be wasting your time, fuel and materials . . . causing needless losses in efficiency. Daily records of these temperatures will show just where the wastes occur . . . enable speedy "diagnosis" and correction!

You can get these records, continuously and inexpensively, with recording thermometers. By specifying Foxboro Temperature Recorders, you'll make sure of getting them *accurately and dependably!*

Foxboro Temperature Recorders are precision-engineered to meet toughest industrial needs for accuracy, endurance and trouble-freedom. Their ultra-sensitive thermal system reacts instantly to slightest temperature changes. Their light, strong recording mechanism "writes it down", day-in, day-out for years without maintenance!

Write for Bulletin 198-2 containing the full story of these automatic aids to waste-elimination. **The Foxboro Company, 24 Neponset Avenue, Foxboro, Mass., U.S.A.** Branches in principal cities of U. S. and Canada.

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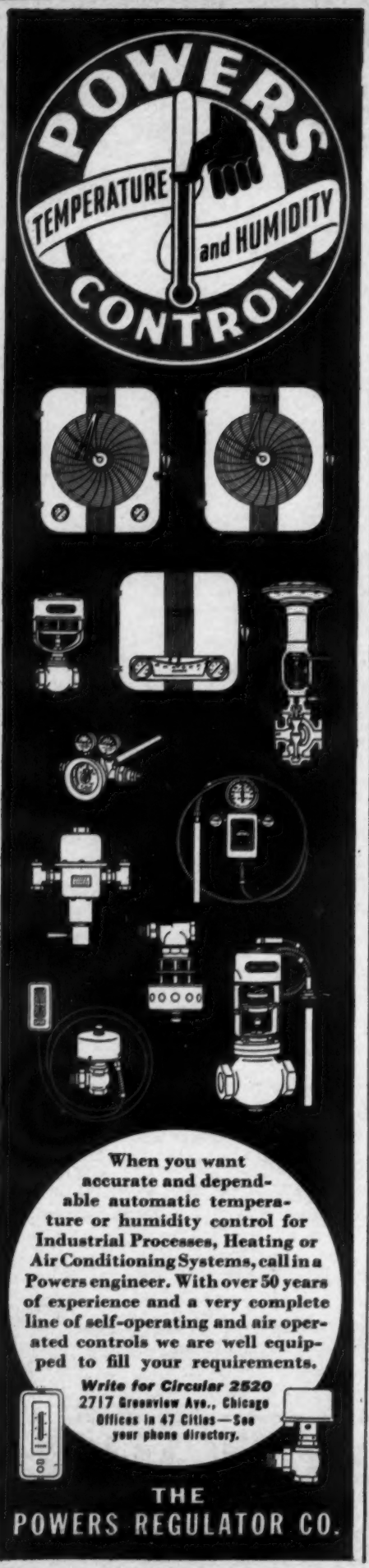

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–1–

AIR MOTORS—and air-power devices are described in two bulletins. The former are small air-driven, double acting reciprocating power units, and the latter classification includes four basic groups of machine tooling equipment. Several units are illustrated by cuts. Smith-Johnson Corp.

–2–

"CAUSES AND CURES—of 14 Common Welding Troubles" is the title of a 18x24-in. chart. Faulty welding jobs are pictured; their causes and remedies are outlined in detail. Westinghouse Electric & Mfg. Co.

–3–

CLAMSHELL BUCKETS—A 20-page booklet in color gives details concerning maintenance and care of buckets. Included are photographs and diagrams of parts and assemblies. Blaw-Knox Co.

–4–

CLEANING—"Exidust" vacuum cleaning system is outlined in booklet that explains special factors and details of Exidust equipment. Illustrations include sectional views and typical installation layouts. Allen Billmyre Co.

–5–

CLEANING EQUIPMENT—dust collectors, sandcutters, and abrasives are described and illustrated in Catalog 40. The airless wheel abrator method of abrasive blast cleaning is featured. American Foundry Equipment Co.

–6–

CLUTCHES—Friction, centrifugal, single-revolution, and over-running clutches are outlined in four bulletins. Information given covers what the operation of each individual clutch accomplishes, and the mechanical details of each. Diagrams and photos. The Hilliard Corp.

–7–

COMMUNICATION—Catalog-Survey Chart makes it possible for the executive to analyze his communication needs and obtain outline of a system suited to his individual requirements. Four basic systems are described.

MAILING COUPON—GOOD UNTIL MARCH 31, 1944, ONLY

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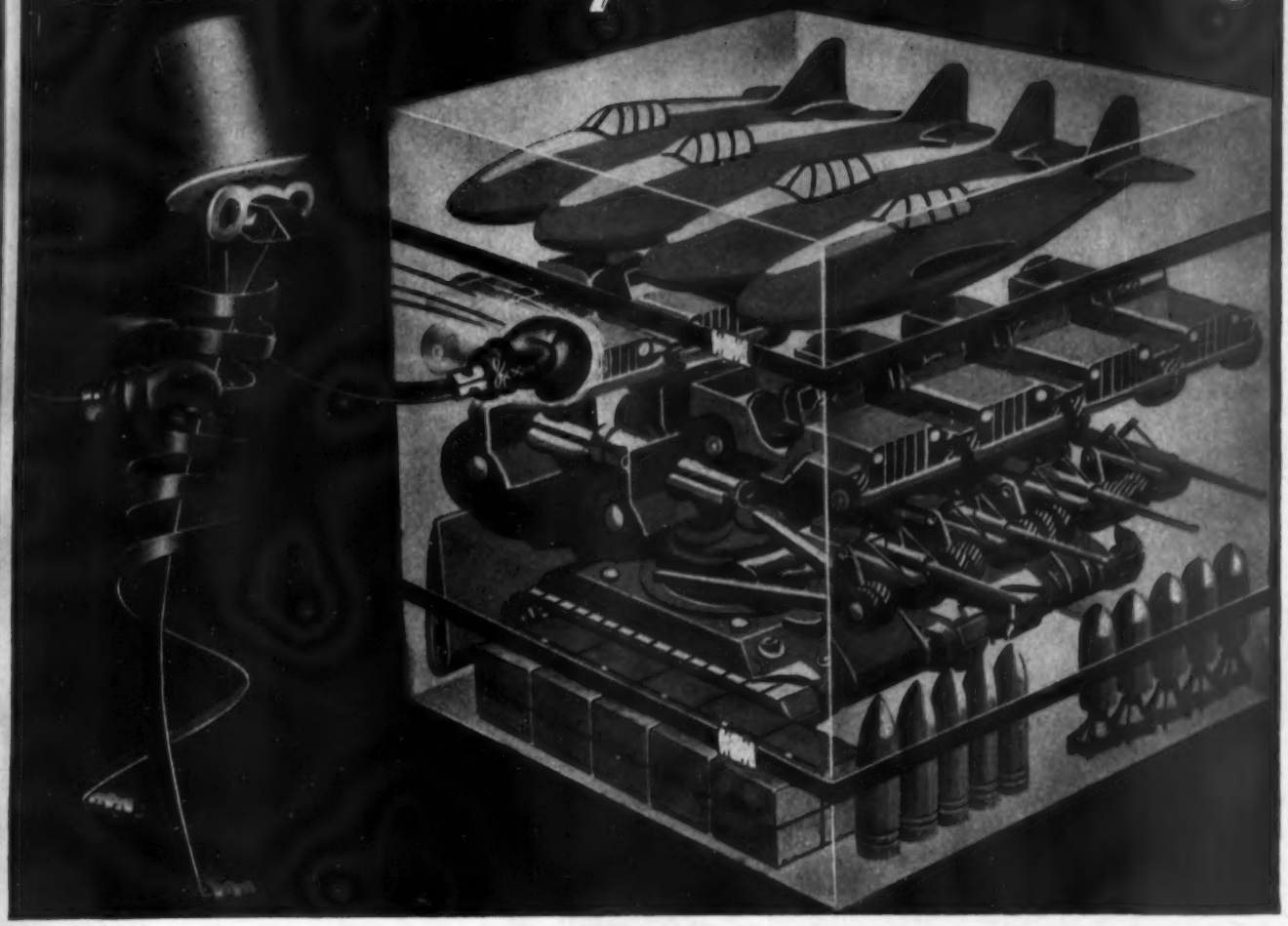


. . . THAT'S *"Bound to Get There"*

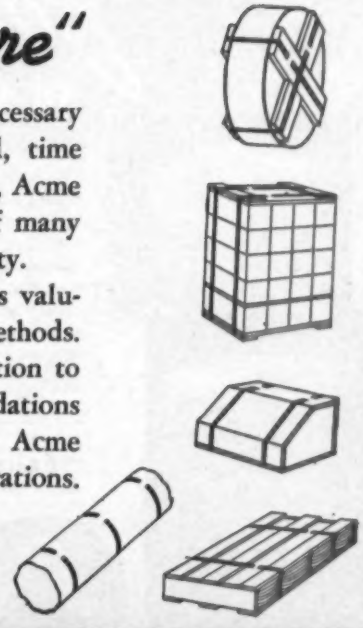
Today, products must be "packed like sardines" and containers, must be "tough as Commandos" . . . to save vital cargo space and weight and arrive safely at destination.

—and here's how Doc. Steelstrap "Packs a Punch" for America and sees that materials are "Bound to get there" with Acme Steelstrap.

Doc. Steelstrap represents our service to industry in diagnosing the packing and shipping of the particular products . . . in prescribing remedies that save tons of weight and hundreds of dollars in unnecessary expense in container material, time and effort. As a matter of fact, Acme Steelstrap often pays for itself many times over in savings and safety.

War problems have given us valuable experience for post-war methods. Here again Acme is in a position to serve you by giving recommendations covering a complete plan of Acme Steelstrap and Unit Load applications.

This service by Acme technical men is available without obligation on your part.



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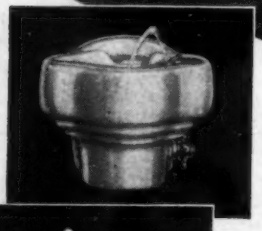

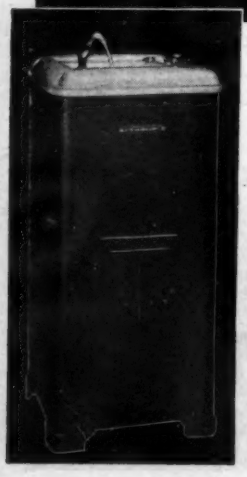

It isn't just the right tools or the wages paid that make a man satisfied at his job. The right working conditions count most of all. Take the drinking water supply, for instance. Drinking fountains strategically placed, to help refresh workers and keep cool water immediately available, without loss of work-time and without danger to health, can promote worker satisfaction to an amazing degree. Whether in shop or office, one name stands out as Industry's choice . . . *Halsey Taylor.*

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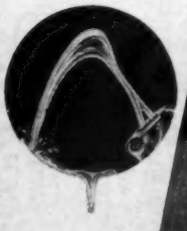

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Drinking Fountains

central control, executive-monitor, multi-master, and fully intercommunicating. Executone, Inc.

–8–

D.C. GENERATORS—designed for use in a wide range of industrial and general applications where continuous use is required, can also be used as exciters. Bulletin illustrates and explains construction features. General Electric Co.

–9–

DESCALING—lime scale and rust from water-cooled and water-circulating equipment is the maintenance problem dealt with in a 28-page manual entitled "Oakite Compound No. 32." Techniques and methods for removing these accumulations are digested. Oakite Products, Inc.

–10–

DESIGN—information for users of the timber connector method of construction is contained in a 40-page manual. The use of teco connectors, data on load values, and spacing, are presented in chart form. Data are drawn in accordance with WPB specifications. Timber Engineering Co.

–11–

DUST—is the subject of two booklets that discuss the methods and necessity for controlling this industrial problem. Dustube dust collectors are diagrammed; specifications, features, and construction are given. Material on auxiliary equipment for dust collectors is included. American Foundry Equipment Co.

–12–

ELECTRONIC CONTROL—for resistance welding is treated in a 46-page booklet. Simplified circuit diagrams are used in explaining the fundamentals of electronic controls available. Also portrayed are electric accessories for resistance welding processes. General Electric Co.

–13–

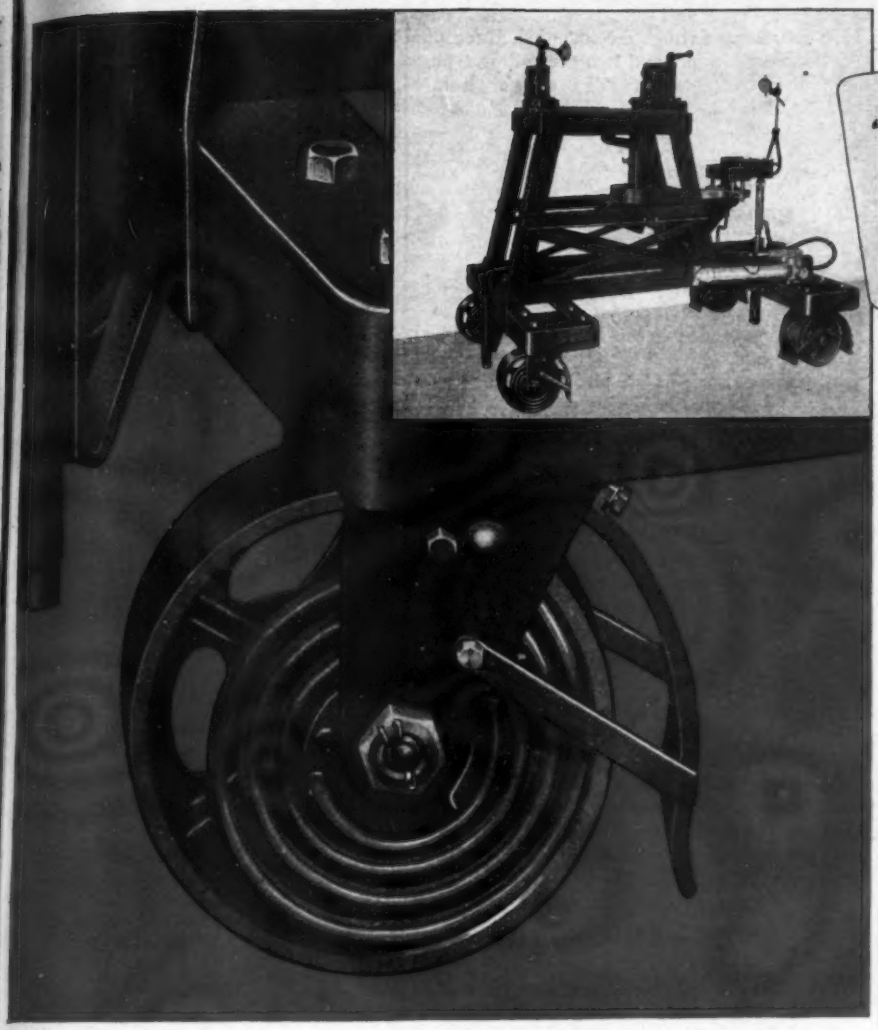
ELECTRONICS IN INDUSTRY—A 44-page booklet, illustrated in color and written in non-technical language, explains electronic devices now in operation in business, government, and education. RCA Victor Div. of Radio Corp. of America.

–14–

FLOORING—roofing, waterproofing products, and their characteristics are presented in folder. Diagrams and photographs amplify the text. Flexrock Co.

–15–

FLUORESCENT LIGHTING—fixtures are illustrated and described in Bulletin F-70.



IT RIDES ON CUSHIONS WHEREVER IT GOES!...

At Dodge-Chicago Corp., the crank shaft assembly stands ride on Bassick 8" "Floating Hub" Casters. These ingenious casters cause the load to be carried off-center of the hub. The shock-absorbing spring cushions the ups-and-downs, protecting the assembly from vibration . . . and keeps the wheels in contact with the floor, steadying the load on even keel. Weight is evenly distributed, and torsional strain eliminated.

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Making more kinds of Casters... Making Casters do more

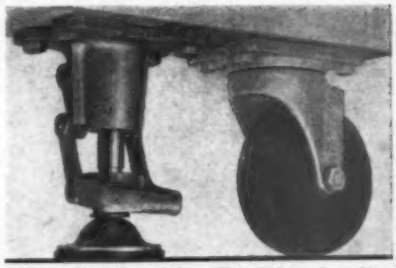
"Bassick makes the largest line To serve you through the years If you have a caster problem Consult with Bassick engineers."

Bassick Grooved Wheel Casters

operating on angle floor tracks, give assembly lines flexible mobility.

Bassick Super-Heavy Duty Casters

will carry any loads that can be moved on a given size of wheel!



Bassick Positive Position Lock

holds portable equipment securely in place.

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Industry's Most Complete Line of TRUCK CASTERS and Related Materials Handling Equipment.

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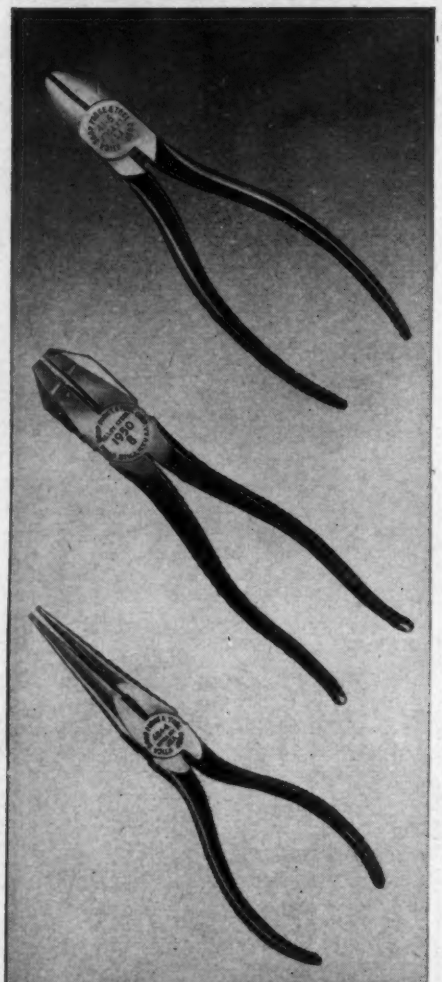
TOOLS
for More Tool Mileage



"War Finish" dulls the appearance of UTICA Pliers and Adjustable Wrenches but UTICA quality is rigidly maintained to provide expertly made tools for industry . . . through our distributors.

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Five four-lamp fixtures are included, three of the suspension type, and two the ceiling type; all manufactured under WPB weight-limitation order L-78. Day-Brite Lighting, Inc.

–16–

GOVERNMENT REQUIREMENTS–for packaging military machinery and parts are summarized in chart-form. Properties and construction of grades A, B, and C wrapping materials are listed, including cellophane laminated sheeting together with the three strength types under each grade. Specified methods of packaging are also outlined. E. I. du Pont de Nemours & Co.

–17–

GRINDING–Handbook for operators of internal grinding machines gives information on selecting the proper wheel for different internal grinding jobs, how to correct common grinding faults, and how to set up the machine for each job. Necessary statistics are given on charts. Norton Co.

–18–

GRINDING OILS–and lubricants are the subject matter of a 38-page booklet that describes uses of different oils suited to the varying requiremnets of thread, gear, and other types of form grinding. Working illustrations. White & Bagley Co.

–19–

HEAT MEASURING–Potentiometer method of heat measurement is described in Bulletin A2-B. Explanation of the electronic principle employed, a list of instrument features, four operating diagrams, and table of potentiotrol scale ranges obtainable are included. Wheelco Instruments Co.

–20–

HEAT-TREATING–furnace as an important production machine, is the theme of a booklet that contains factors contributing to the manufacture of a good industrial furnace. Surface Combustion.

–21–

HYDRAULIC MACHINERY–is featured in catalog which also treats special machinery, power and test units, presses, tools, jigs, and fixtures. Photographs of each unit accompany detailed descriptions. Hydraulic Machinery.

–22–

INFRA-RED–The history and development of infra-red radiant heating, its usage, and role in post-war industries are discussed in an illustrated booklet. C. M. Hall Lamp Co.

–23–

"LIFT TRUCK–Operators Guide" is a 24-page booklet that interprets the importance of materials handling. Operating instructions, safety hints, and care of the lift truck are

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● **PRODUCTION ENGINEERS**
Including electrical and mechanical engineers familiar with any phase of radio, radio-phonograph and television production.

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Men with degrees in electrical engineering or comparable experience in radio and television.

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Men with experience in mechanical designing, especially of small metal parts and of the automatic machinery to mass-produce them.

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Must have science degree in physics. Some practical experience in radio is desirable.

WE expect the men who qualify for these positions to become permanent members of our staff and take an important part in our post-war program.

To maintain the Philco tradition of progressive research and development, is first and foremost in our minds. We provide the finest of technical equipment. But often, even more helpful is the inspiration and personal assistance of working with men who have done so much for the advancement of Radio, Television, Refrigeration and Air-Conditioning.

WRITE US TODAY

Qualified men not now engaged in work requiring their full talents, are invited to write us in detail as to their experience, education, family and draft status, and salary. Letters will be treated in strict confidence.

Hiring subject to local W. M. C. rulings.

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A full ¼-inch capacity drill (illustrated) weighing only 1 lb. 9 oz. is one of the latest additions to the ARO line.

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● Break through "bottlenecks" in your small tool operations... by installing ARO Pneumatic Tools! With tremendous power in a surprisingly small unit, ARO gets small tool jobs done *efficiently* and *fast!* Reduces fatigue, too!

The ARO line of small pneumatic tools is especially easy-to-handle for women operators... for drilling, nut-setting, screw-driving, grinding, and countless other jobs. Simple in design... rugged... dependable... stall-proof. Ask ARO Field Engineers to help solve your special tool problems and the adaption of standard tools to your operations. Write for catalog. The Aro Equipment Corporation, Bryan, Ohio.

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A DIRTY FACE, IN SUNDAY SCHOOL!

Tommy overlooked the importance of washing his face the morning the cast for the Childrens' Day program was chosen . . . and Tommy didn't get a part.

A large manufacturer of airplane parts overlooked the importance of having his plant machinery physically clean before attempting to repaint them. He didn't know that the cleaner he was using had very little effect upon the oily deposits on the machines. Consequently, the paint wouldn't stick. Production was seriously slowed down, waiting for the paint to dry.

A Magnus Service Representative remedied this situation with Magnusol. The machines to be cleaned are now sprayed with a Magnusol solution, 1 part to 8 parts of kerosene and wiped clean with a damp cloth.

Using this method and material, the machines are cleaned and spray painted—and within 3½ hours are back in operation.

This job is typical of the service that Magnus men have given to hundreds of manufacturers in all lines of industry. Perhaps you have a cleaning problem that needs attention. Consult us . . . you'll be under no obligation and we may be able to help you.

Write for the Handbook covering the Cleaning problems in your industry.

Metal Cleaning
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Manufacturers of Industrial Cleaning Materials - Washing, Drying, Pickling Equipment - Metal Drawing Lubricants.

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TO END ALL PROBLEMS OF CORROSION

Saran is a tough thermoplastic originally made to replace such strategic war materials as aluminum, stainless steel, nickel, copper, brass, tin and rubber. Now found adaptable to a wide range of uses in product designing, food processing and wherever non-corrosive materials are necessary. Its insulating qualities, flexibility and ease of handling make it extremely valuable in installations dealing with oils, gases, air, water and corrosive chemicals. It is available in tube, pipe, sheet, rod and molded fittings. Technical Bulletin P-8 will be sent on request. Address Dept. SJ.

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SAN FRANCISCO . . . 121 Second St.

given, emphasized by drawings of load-carrying devices and methods of stacking. Towmotor Corp.

–24–

LIGHTING EQUIPMENT – "Shielded light is better light" claim the makers of Louver-plas, a plastic designed to solve fluorescent lighting problems. Further details, price lists, and sheets illustrating standard stock molds are available. Ivan T. Johnson.

–25–

LUBRICANT—application chart suggests the lubricant best suited to plant equipment of various requirements. Hydraulic systems, reduction gears, and air compressors are among apparatus included. E. F. Houghton & Co.

–26–

"MAINTAINING—Your Buildings Today" is a booklet that discusses floor treatments, calking compounds, roof coating, waterproofings, and paints. Description, recommended use, and coverage are given for each product. Divided into four sections for easy reference. L. Sonneborn Sons, Inc.

–27–

MANGANESE STEEL—Called "the toughest steel known," its physical properties, and factors of breakage and wear are digested and pictured in two booklets. One emphasizes its use in the railroad industry; the other deals with cement mill equipment. American Brake Shoe Co.

–28–

MATERIALS HANDLING—machinery for production, processing, storage, and shipping is treated in a book that gives methods and suggestions for moving goods quickly and economically. Photographs demonstrate the methods in use. Yale & Towne Mfg. Co.

–29–

NEAR INFRA-RED—process and its application in the aviation industry are treated in an 8-page booklet. Diagrams and photographs show baking, drying, dehydrating, and preheating operations that are affected by the process. Fostoria Pressed Steel Corp.

–30–

ODT 17—The complete text of wartime delivery restrictions which became effective October 11, is featured in booklet, together with authoritative interpretations covering both the Regulations and General Permits issued under them. Included is a section on truck conservation and maintenance in wartime. The Studebaker Corp.

–31–

PACKAGING—Instructions for packing and shipping steel mill products overseas are contained in fully illustrated, 180-page manual.

ROCKBESTOS A.V.C. Wires and Cables

Provide the most direct approach to eliminating wire failures in lighting, control and power circuits

THE ROCKBESTOS CONSTRUCTION THAT PROVIDES LONG WIRE LIFE*

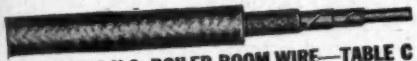
1. The conductor is perfectly and permanently centered in helically applied insulation.
2. Impregnated felted asbestos insulation withstands conductor-heating currents and won't burn, even under overloads up to the melting point of copper.
3. Lubricated varnished cambric for high dielectric strength and added moisture resistance, protected from heat, flame and oxidation between two felted asbestos walls.
4. Outer felted asbestos wall impregnated with heat, flame and moisture resistant compounds serves as a heat-barrier against high ambient temperatures.
5. A tough, rugged asbestos braid, resistant to heat, flame, moisture, oil, grease and corrosive fumes.

**One of 122 different wires and cables developed for severe operating conditions by Rockbestos.*

WON'T bake brittle, bloom, burn or rot.

RESISTS moisture, oil, grease and fumes.

Rockbestos A.V.C. Power Cable above and similarly insulated Motor Lead Cable (Underwriters' and Nat. Elec. Code, Type AVA) has a maximum operating temperature rating of 110° C. (230° F.) and this permanently insulated construction. See detail, upper left.



600 VOLT A.V.C. BOILER ROOM WIRE—TABLE C
(Underwriters' Type AVA)

Sizes No. 18 to 4/0 AWG. This construction for sizes 18 to 8, sizes 6 to 4/0 have another wall of impregnated asbestos next to the conductor.

For lighting and control circuits exposed to heat and moisture, oil, grease, corrosive fumes or fire hazard, such as exist around furnaces, ovens, lehrs, soaking pits, boilers, etc., this widely used A.V.C. construction is ideal.

600 VOLT ALL-ASBESTOS RHEOSTAT CABLE—TABLE R
(Underwriters' Type AI)

Sizes No. 18 AWG to 1,000,000 CM insulated with a heavy wall of impregnated asbestos, covered with a rugged asbestos braid in black, white or colors.

Use this power and rheostat cable for wiring rheostats, elevator and locomotive control panels, and electrical equipment exposed to heat, fumes and fire hazard. Also for general open wiring in dry, high temperature locations. For solid conductor specify Rockbestos Rheostat Wire, Table A.

600 VOLT A.V.C. CONTROL CABLE

In one to 19 conductors. Standard stranding AWG No. 12—19/-25 and No. 9—19/-22. Other strandings furnished on order.

Designed for use under conditions too severe for control cables with other insulations which deteriorate rapidly when exposed to high temperatures. Operates without failure under attack of heat, oil, grease or corrosive fumes and may be installed in conduit as it has ample moisture resistance.

FOR VICTORY BUY WAR BONDS

There are two ways to practically eliminate wire-failures in electrical circuits around furnaces, soaking pits, steam tunnels, lehrs, kilns and other high temperature locations. One is to move the circuits away from the "hot-spot" area, but that might be impossible or too costly. Another, is to install wire with an insulation that is unaffected by heat and built to stand up under severe operating conditions.

Rockbestos A.V.C. wires, cables and cords are designed and constructed to provide lasting trouble-free performance. They stand up where other wires fail because the *permanent* impregnated asbestos insulation resists heat and moisture, oil, grease, alkalies and corrosive fumes, and won't bake brittle, crack, flow, rot or swell.

Get the facts on Rockbestos A.V.C. See for yourself how these *permanently insulated* wires and cables keep wire-failure down to the minimum in lighting, power and control circuits. When inquiring or ordering, please furnish CMP allotment number and certification. For complete information and samples, write nearest branch office or:

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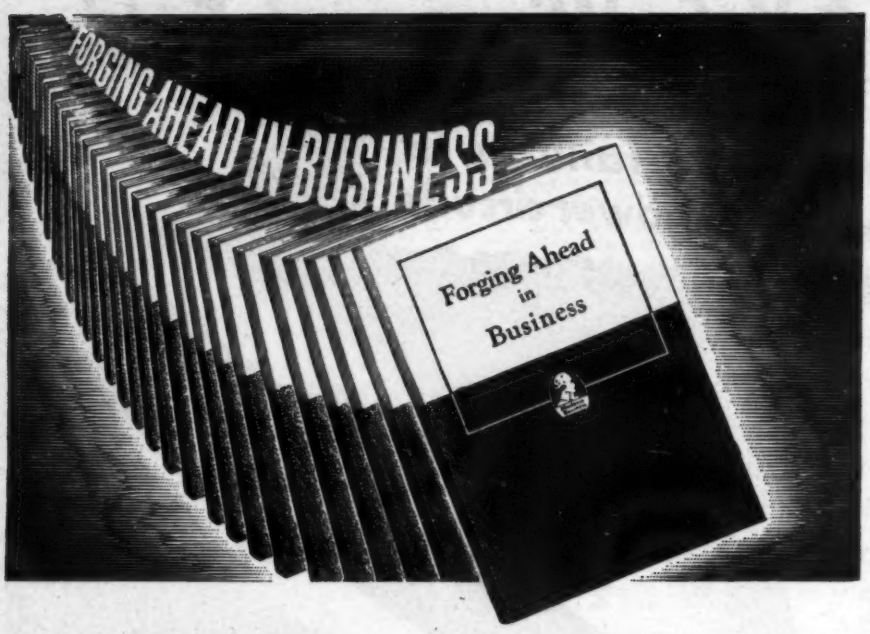

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–32–

PACKING GUIDE – Four-page bulletin tabulates fluids handled in process work, and lists a packing for each. Additional tabulation describes the form and construction of each packing. Tables of sizes and weights are also included. Greene, Tweed & Co.

–33–

PIPING DESIGN–is treated in bulletin 43-A, entitled "Simplified Method for Calculation of Pipe Wall Thickness." Data on pressures and temperatures are clarified by charts. Midwest Piping & Supply Co., Inc.

–34–

PORTABLE ELECTRIC TOOLS–used in war production and construction are given in a catalog that features a special section on the care and operation of the tools shown. Skilsaw, Inc.

–35–

PROTECTIVE COATINGS–Line of industrial coatings is presented in 24 illustrated pages, together with product analysis and application charts. Prevention of corrosion is treated in text. Carbozite Corp.

–36–

PUMPS–Specifications, selection information, applications, and features of turbine-type and centrifugal pumps are outlined and charted in 12-page booklet. All pumps mentioned are diagramed. Aurora Pump Co.

–37–

PYROMETER–Accessory Manual, #P1211, gives engineering data on the selection and installation of thermocouples, protection wells, lead wire, and calibration tables. The Bristol Co.

–38–

RECORDERS–designed to measure the pH of a plant process continuously are described in Catalog N-96 (1). The equipment consists of two elements, which are said to be easily installed. Diagrams included. Leeds & Northrup Co.

–39–

RECORDING THEMOMETER–for frozen food locker plants has been developed by manufacturer of industrial recording and controlling instruments. Data sheet gives installation, specifications, and use. The Bristol Co.

–40–

RECTIFIERS–Ignitron mercury-arc rectifiers for 501-kw. and higher ratings, 250 to 900

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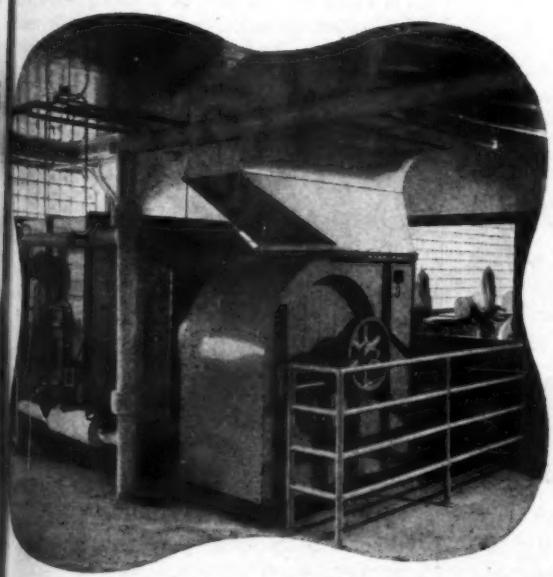

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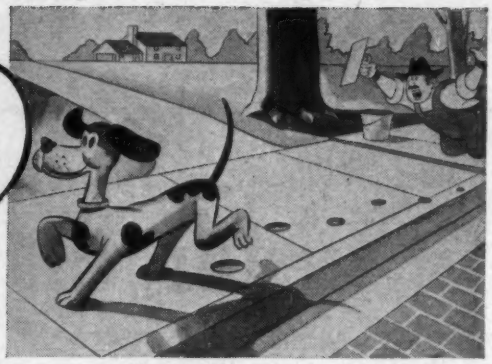

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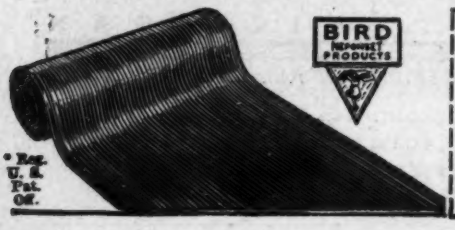

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volts, are featured in a 36-page bulletin. Their design, mechanical construction, and operation in converting alternating current to direct current are discussed in the text. Important features are pointed out by schematic diagrams. General Electric Co.

–41–

REFRIGERATION—and air conditioning are treated in an illustrated booklet that covers their uses at home and on the fighting front. The importance in food processing, storage, and transportation is emphasized. The part of atmospheric control in war production is explained also. Air Conditioning & Refrigerating Machinery Assn., Inc.

–42–

ROPE—"The Rope Maker" contains a history of rope through the ages, as well as a description of its manufacture and usage today. Points are illustrated with photographs and cross-section diagrams of various wire ropes now being manufactured. Rochester Ropes.

–43–

SAFETY AND HEALTH—Products for employees are described in detail in 26-page catalog. Rubber and synthetic rubber gloves, aprons, respirators, welders' shields, goggles, and rubber clothing are included. Dunn Products.

–44–

SAWS—are the subject of Catalog 43-V, a combination technical instruction book and sales manual. Full line of hand and power blades, with tables of working specifications, is given. Catalog is loose-leaf, so that later data can be added. Victor Saw Works.

–45–

"SOLUTIONS—to Some Executive Problems" contains suggestions dealing with the increase of production, the lowering of cost, and the improvement of quality. Workable ideas rather than cut-and-dried formulas are given. Pioneer Eng. & Mfg. Co.

–46–

STAMPING TRIMMER—is described in 8-page bulletin QW-115. This machine is claimed to trim, form, bead, or flange both large and small stampings in straight-line production or in job shop work. Whiting Corp.

–47–

STEAM PLANT—equipment, steam traps, and expansion joints are the topics of three descriptive bulletins. Valves, gages, strainers, nozzles, and indicators are included. Pertinent information, such as pressure weights, construction details, and dimensions, is given in full, with diagrams. Yarnall-Waring Co.

–48–

STEAM-TYPE HUMIDIFIERS—An 8-page illustrated booklet presents engineering data

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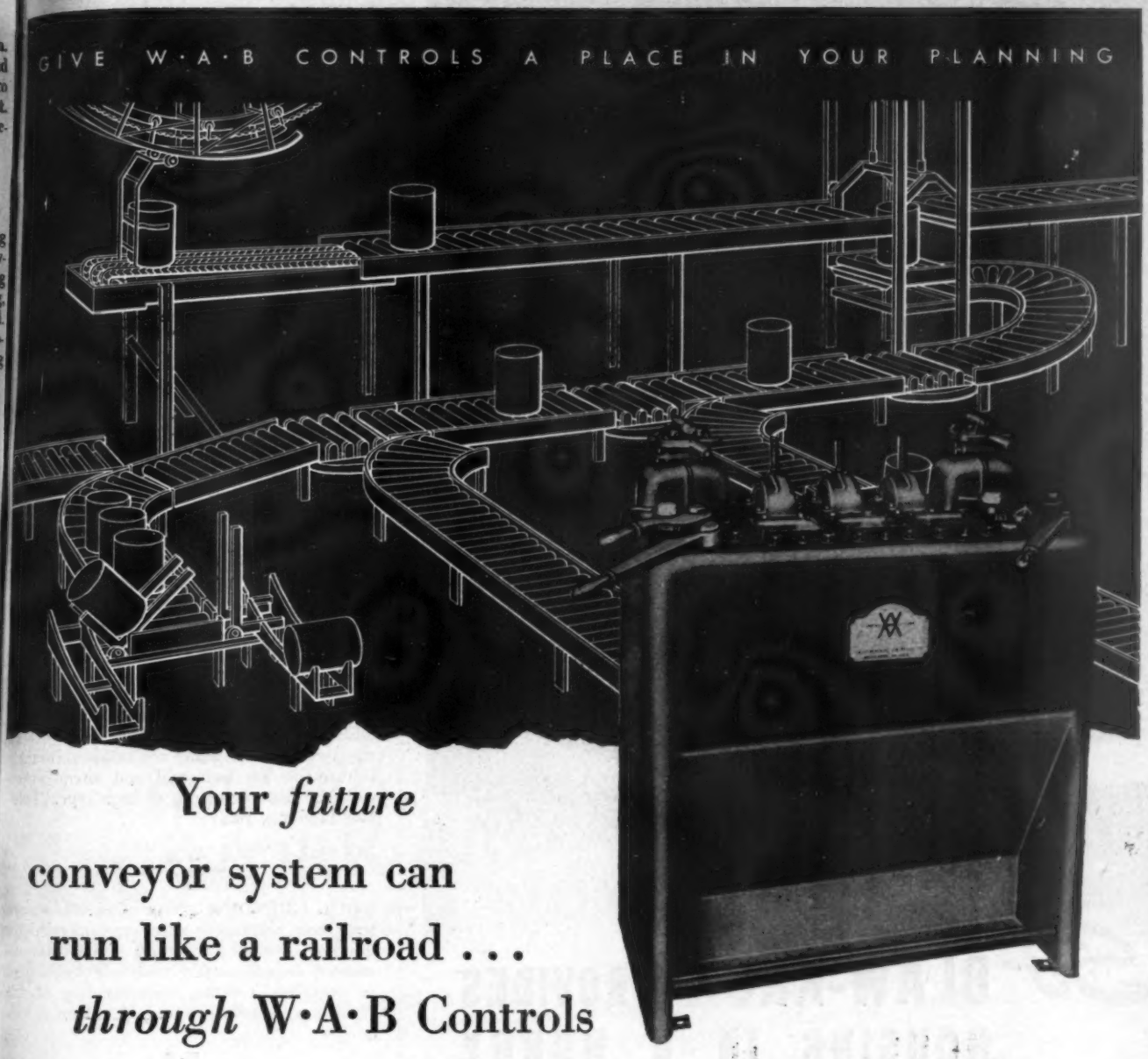

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on unit steam-type humidifiers. Shows effects of automatic humidification on materials, and advocates air conditioning system for healthful working conditions. Operating features and installation data are included. Armstrong Machine Works.

–49–

STEEL PARTS—and finished articles, heavy structural sections, and instrument mounting structures are described in Bulletin 114. Falstrom Co.

–50–

STEEL STRAPPING—and its uses for protecting war shipments are told in Acme Process News No. 14. The application of steel bands is given for everything from "harnessing" gas bombs to packaging army trucks. Fully illustrated. Acme Steel Co.

–51–

SYNTHETIC RUBBER—Charts of the commercial types of synthetic rubber, history of its development, and review of its chemical content are included in a booklet distributed by New York Belting & Packing Co.

–52–

TESTING EQUIPMENT—Catalog of 48 pages reviews the many electronic measuring instruments for industrial and aircraft uses, with the main functions of each type. Televiso Products, Inc.

–53–

TOOL GRINDING—Nine illustrations with text show progressive steps recommended for grinding of almost any form of Carboloy cemented carbide cutting tool, and are helpful in acquiring a better understanding of the principles actually involved. Denham & Co.

–54–

TRUCKS—and casters, comprising entire line of equipment made by this manufacturer, are illustrated in 64-page general catalog that presents its material on a "job-suited" theme basis. Much information on basic materials handling engineering is also included. Thomas Truck & Caster Co.

–55–

VALVES—for marine and industrial use, trademarked Kerotest, are illustrated with detailed specifications of each series type and size in 32-page cloth-bound Catalog 43-M. Manufacturing and laboratory facilities are described, and information is included on alloy specifications and engineering standards met by the product. Kerotest Mfg. Co.

–56–

"WAR PRODUCTION DATA"—is title of 30-page pamphlet that covers material on rust prevention, lubrication, metal-working, heat-treating, and machining of armament. E. F. Houghton & Co.

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FOR ADMINISTRATIVE AND OFFICE AREAS

Open type fixture for direct or suspension mounting. 4 — 40 watt lamps.

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New type plastic die-formed, stay-put side panels; "Snap-on" body for low cost maintenance, complete "on and off" operation in less than 5 seconds. Direct or suspension mounting. 4 — 40 watt lamps.

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For single unit or continuous installations. "Snap-on" reflectors for low cost maintenance, complete "on and off" operation in less than 5 seconds. 2 — 40 watt, 3 — 40 watt and 2 — 100 watt lamps.

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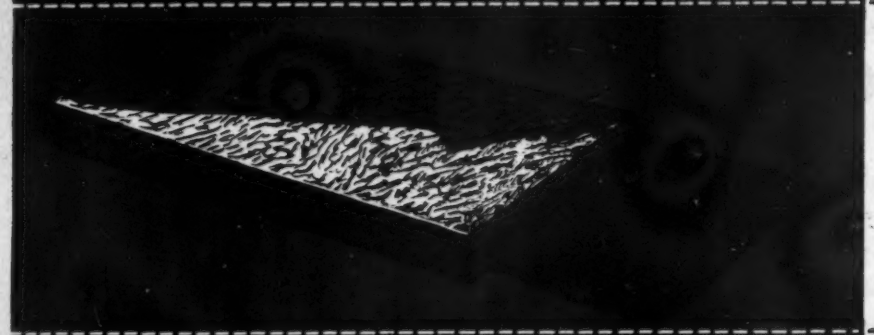

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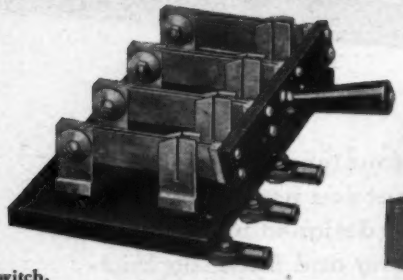
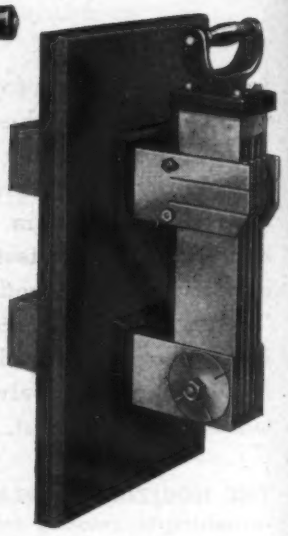
THIS switch is of heavier design than the average, with all steel parts, extra heavy gauge, plated to be corrosion-resistant and all actuating parts case hardened. Extremely compact . . . small and narrow with no projections beyond width of box, it permits mounting where space is limited. With a (baked) finish both attractive and durable, the switch "fits" into office as well as plant locations . . . wherever good appearance and long service are important. Ask for Bulletin 1300.



★ 200 amp., 4 pole, single throw, back connected, non-fusible knife switch.



★ 5000 amp. d.c. single pole, laminated stud knife switch.

LIKE the Safety Switch, this Type "A" Knife Switch is of heavy duty construction . . . jaws set into base blocks, securely riveted and sweated into place, all current carrying parts of electrolytic copper. Hinges and receptacles are of rugged construction. Another feature is the exceptionally generous contact area with laminated poles maintained under high pressure due to the clamping effect of multiple construction. Ask for Bulletin 1320.

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POWER TO LIFT A TANK in the palm of your hand!

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with a Distinctive New Feature

TOOL WEAR ANALYSIS

Careful analysis of wear on a dull KENNAMETAL tool may suggest changes in procedure that will result in longer life. To obtain the best tool performance, two conditions must prevail. (1) The carbide tip should be of as hard grade as use on the job will permit without chipping or breaking. (2) The dulling due to edge wear and that due to cratering should be about equal.

Chipping or breaking of tools while in use may be the result of faulty grinding, as are 75% of all breakage failures. For this reason, first check present grinding methods with recommended practice, pages 38 to 48, and make corrections if needed, before changing grades in an effort to remedy this trouble.

If inspection discloses that edge wear and cratering are unequal, the relationship between speed and feed should be checked. By referring to the table of recommended speeds for various hardnesses on page 27, it can be ascertained if the speed being used is within the proper general range. Table A on the opposite page will help adjust speed and feed on a particular job to balance edge wear and cratering for maximum life of a tool before it dulls to the point of necessary resharpening.

This table, however, provides for adjustment within the limits of a single grade only. Further analysis may indicate that additional improvement in tool life can be obtained by changing to a more suitable grade.

A revised edition of our Tool Manual is just off the press. It has been brought up to date and a new section added, called "Tool Wear Analysis."

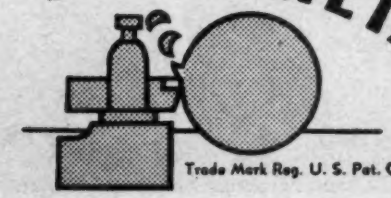
Unique ways and means for determining how overall performance may be improved following visual inspection of a dull tool are described and illustrated by charts. The analysis is based on the premise that the best tool performance and maximum life between regrinds is realized when conditions are such that the dulling of a carbide tip due to edge wear and dulling due to top surface wear are maintained in balance, and at a minimum.

This new section of the Manual suggests that a check be made: First, of the prevailing grinding methods to see if they are in harmony with recommended practice; second, of the cutting speed used, to ascertain if it is within the prescribed general range for the particular material being machined. A chart is provided to show the proper relation between speed and feed, and how adjustment may be made in this respect for best results as to wear resistance on a particular job within the limits of a single carbide grade. Finally, characteristics of the several KENNAMETAL grades are given with charts provided to facilitate analysis and to determine if a change in grade would be advisable to effect improvement.

You will, of course, want this valuable manual with its distinctive new feature; it will help assure the continued efficiency of your KENNAMETAL tools. A copy will be forwarded upon request.

The revolutionary method of analysing tool wear discussed in the KENNAMETAL Manual is also available in the form of a wall chart especially designed for shop and tool room use. Write for yours today.

KENNAMETAL



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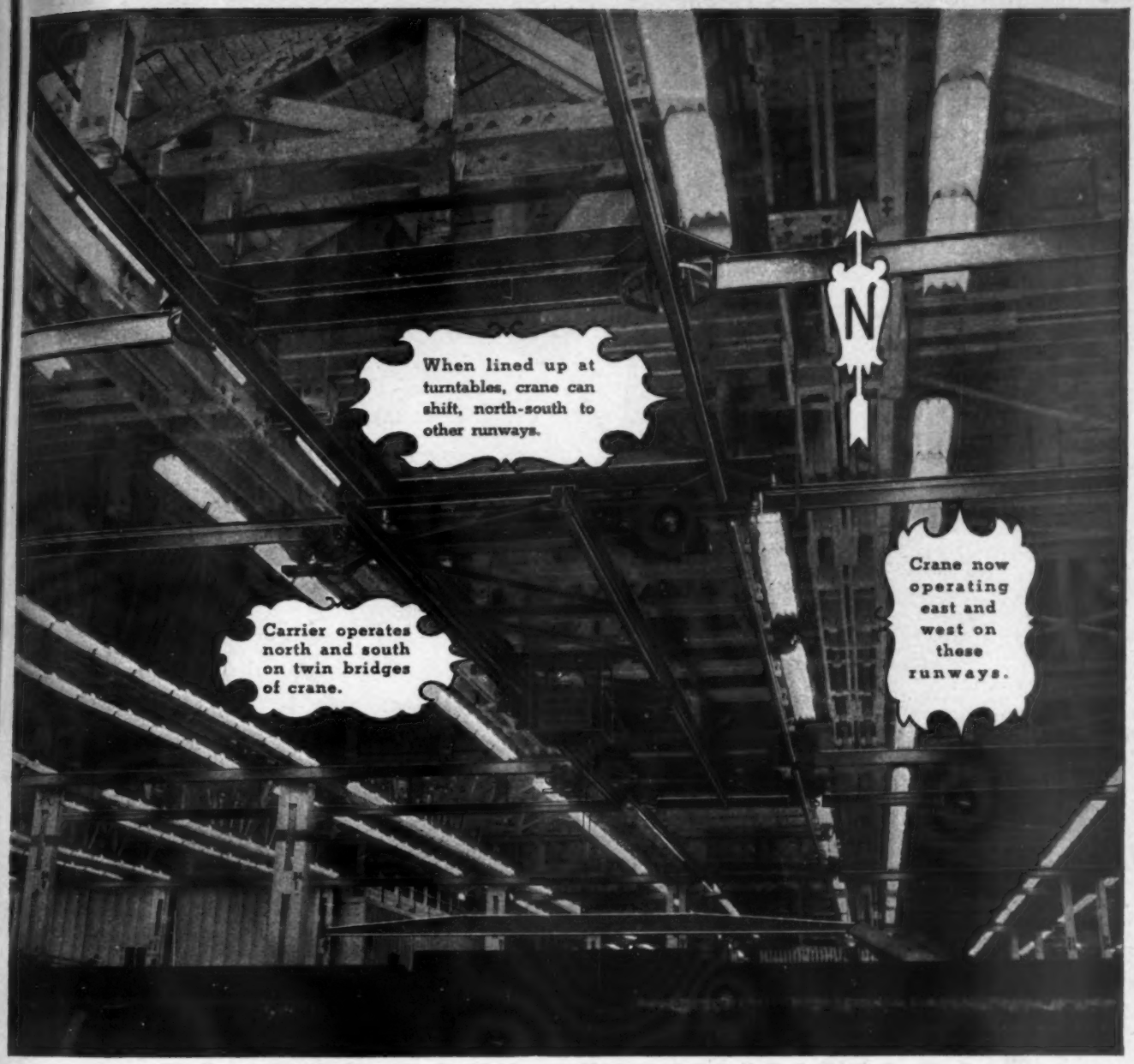
LATROBE, PA.

SUPERIOR CEMENTED CARBIDES


When lined up at turntables, crane can shift, north-south to other runways.
N
Crane now operating east and west on these runways.
Carrier operates north and south on twin bridges of crane.

No One-Way Streets

Cranes no longer need lead a one-track life. American MonoRail engineering now makes it possible for crane bridges to operate north, east, south or west to furnish hoist hook service throughout the largest plants ever built.

The photo shows how this was accomplished in the largest timber structure ever built. And while it is one of the first installations of its kind in the country, plant engineers claim that it is proving a big production help.

Regardless of size, American MonoRail engineering service is available on any project. This service is offered cheerfully and without obligation.

SEND FOR BULLETIN C-1. A 56 PAGE BOOK SHOWING SUCCESSFUL APPLICATIONS OF AMERICAN MONORAIL SYSTEMS.

THE AMERICAN MONORAIL CO.

13114 Athens Avenue ★ Cleveland 7, Ohio

CONTINUING LEADERSHIP

. . . through the war and beyond!

The start of the new year finds instrument headquarters still *busy at it* in the final drive for victory. Dependable WESTON instruments, in all familiar types, continue flowing in unprecedented quantities to every battle front. *In new types, too;* for all during this period of stress WESTON development laboratories also have *led the way* . . . continually meeting the new measurement problems of this mechanized war. Thus when instrument priorities are relaxed, WESTONS will continue as industry's *standards* for all measurement needs. For, *new* measurement tools as well as *old* will be available in their most *trustworthy form* . . . here at instrument headquarters. Weston Electrical Instrument Corp., 628 Frelinghuysen Ave., Newark 5, N. J.

Laboratory Standards . . . Precision DC and AC Portables . . . Instrument Transformers . . . Sensitive Relays . . . DC, AC, and Thermo Switchboard and Panel Instruments.

WESTON

Specialized Test Equipment . . . Light Measurement and Control Devices . . . Exposure Meters...Aircraft Instruments... Electric Tachometers...Dial Thermometers.

FOR OVER 55 YEARS LEADERS IN ELECTRICAL MEASURING INSTRUMENTS

LADISH FORGINGS

fight with America's Aces

● In all weather—on all fronts, America's Aces depend on their engines to pull them through. In making crankshafts, gears, propeller shafts, propellers, landing gears and other forged steel parts for these planes, Ladish fights with America's Aces.

TO MARK PROGRESS

ARMY E NAVY

LADISH DROP FORGE CO.

CUDAHY [MILWAUKEE SUBURB] WISCONSIN

This cable resists:

HEAT

ACIDS

OILS

MOISTURE

Okolite-Okoprene cables successfully meet the hazards of industrial plant operation. Insulated with Okolite and protected by an Okoprene* sheath, they are heat resistant and can be used in circuits running near blooming mills, furnaces, soaking pits, boiler rooms, steam lines and pouring ladles. Resistant to the solvent action of grease and oils, Okoprene is not deteriorated by the cutting oils used on pipe-threading machines or by lubricating oils from cold-rolling mills. Acid problems existing near pickling and plating tanks are overcome by Okoprene. Over and above this, the toughness, flexibility and abrasion resistance of the Okoprene covering mean unexcelled ability to withstand mechanical abuse.

Okolite-Okoprene cables are made in a full range of capacities, and sizes for all electrical applications. Write for Bulletin OK-2009B. The Okonite Company, Passaic, N. J.

*A neoprene protective covering developed by Okonite for severe applications. Resistant to moisture, flame, oil and sunlight, Okolite-Okoprene cables can be installed in ducts, buried directly in the earth, or exposed to the elements—*without additional protection.*

3396

Okolite-Okoprene

THE OKONITE COMPANY

INSULATED WIRES AND CABLES

JOHNS-MANVILLE JM PRODUCTS

JOHNS-MANVILLE *Asbestos* Built-Up Roofs

BECAUSE your roof doesn't leak, don't take it for granted that it is not heading for trouble. J-M Roof Survey reports reveal many roofs with torn flashings, dried-out roofing felts, even rotted decks . . . yet because they hadn't started to leak, they were assumed to be in "good condition."

The Johns-Manville Roof Survey plan offers you an easy way to get the facts about your roof and these facts may save you an expensive repair bill later on.

The report will tell you the condition of all the critical areas . . . flashings, deck, roofing felts, parapet walls, skylights, etc. It will also give you a permanent record for reference so that you can plan ahead for any maintenance work which may be needed in the future. Why not inquire about this J-M service? There is no obligation.

Ask for this free Roofing Book

Based on over 85 years' experience with roofing problems of all kinds, Johns-Manville has published an interesting booklet entitled "Things You Should Know About Your Roof." It discusses all the critical areas and is liberally illustrated with easily understood diagrams. It includes a complete description of J-M Asbestos Built-Up Roofs which are well known for their fireproof, rotproof and lasting qualities. For a free copy, mail the coupon.

JOHNS-MANVILLE—Desk "F"
22 E. 40th St., New York 16, N. Y.

Gentlemen:

Please mail me a free copy of your book "Things You Should Know About Your Roof."

( ) *Check here for further information about the J-M Roof Survey Plan.*

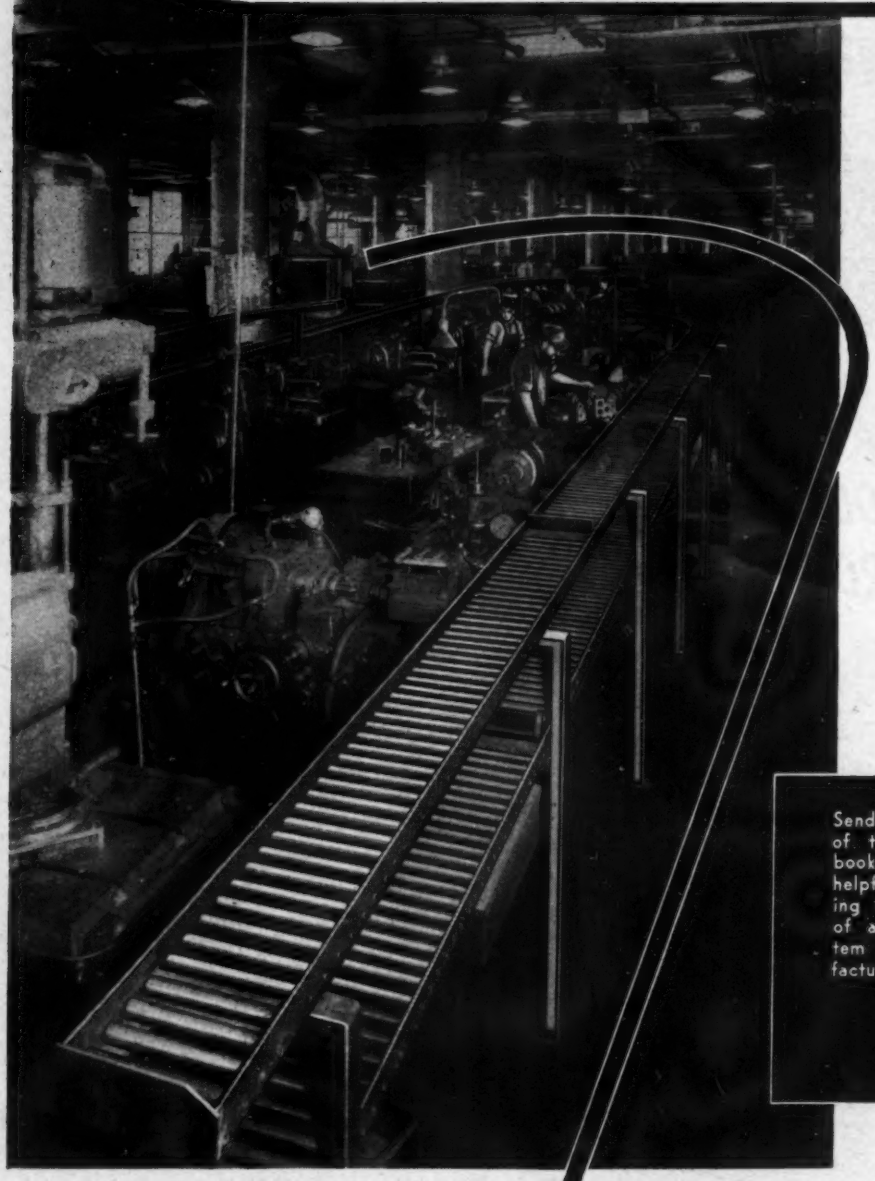
Name_____ **Title**_____

Firm Name_____

Address_____

City_____ **State**_____

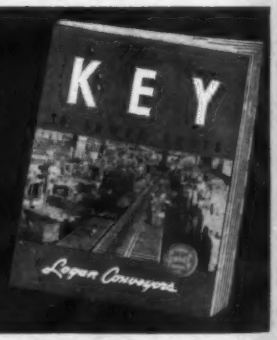
V-DAY PRODUCTION
must flow too!



Manufacturers thruout the nation will attest the value of Logan conveyor equipment in stepping up the flow of war production. And the lessons learned will carry over into peace-time production as well—enabling companies to meet the changing post-war competitive situation by saving time, manpower and money at receiving points — processing — assembly — shipping. The time is NOW to plan your V-day re-conversion and to consider the practical application of Logan conveyor equipment to postwar manufacturing problems. Logan Co., Inc., 510 Cabel St., Louisville, Kentucky.

WRITE FOR INFORMATION ON LOGAN CONVEYOR EQUIPMENT

Send for your copy of this informative book — it will be helpful in determining the application of a conveyor system to your manufacturing operations.



At Left—Logan double-deck Roller Conveyor in an electric motor manufacturing plant.

Logan Conveyors

PUT *FLOW* INTO PRODUCTION

Where to Use SYLPHON BELLOWS

The answer to countless design problems is the Sylphon Seamless Metal Bellows. In Thermostat assemblies, for instance, this amazing Sylphon Bellows helps solve the problems of temperature control in internal combustion engines, diesels, refrigeration and air conditioning, heating and ventilating, and many phases of industrial processing.

As highly efficient diaphragms used to convert pressure effects into controlled movement in instruments, appliances and machines of various types . . . as flexible seals, expansion chambers, rotating shaft seals, packless glands and for endless similar purposes, the Sylphon Seamless Metal Bellows is constantly replacing less durable, less dependable materials in the products of leading manufacturers.

Sylphon Bellows were pioneered 40 years ago by The Fulton Sylphon Co. And they have been first choice of American Industry ever since. Write today for Bulletin TV-535 which offers many suggestions for the designing engineer.

ARMY E NAVY

THE FULTON SYLPHON CO.
KNOXVILLE, TENNESSEE

Temperature Controls . . . Bellows . . . Bellows Assemblies

Why are so many drives of all types being belted with .. GRATON AND KNIGHT "Research"?

...Because "Research" gives you

THE 3 BIG ADVANTAGES OF QUALITY + LEATHER

MORE PRODUCTION, because leather's superior traction, which improves with age, means more power delivered . . . greater average machine production.

LESS MAINTENANCE, because leather has natural "give-and-take" to handle shock loads without undue strain on belt or equipment.

LONGER LIFE, because the tough, interlocking fibres of leather have high resistance to both surface wear and internal friction.

and

3 EXCLUSIVE FEATURES OF "RESEARCH" + BELTING

MOST PRODUCTION, because "Research" currying, added to leather's superior traction, creates highest frictional surface. 3% more production guaranteed.

LEAST MAINTENANCE, because G&K's pre-stretching process removes non-elastic stretch, resulting in fewer take-ups. Tensile strength is also increased 15%.

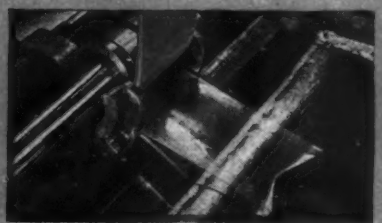
LONGEST LIFE, because precise, weight-controlled lubrication of fibres develops extremely long life. "Tension-Cementing" insures against ply separation.

YOU'LL GET AT LEAST 3% MORE PRODUCTION ...2 to 4 TIMES LONGER LIFE...ON LONG OR SHORT CENTERS

MORE PULLEYS ARE BELTED BY "RESEARCH" THAN BY ANY OTHER BRAND!

In G&K's currying process, the amount of grease worked back into the dry leather to give pliability and frictional surface is controlled by precise weighing — for more "built-in" pulley grip.

An exclusive method — pre-stretching according to hide characteristics — removes initial stretch and increases tensile strength — proved by Research performance in eliminating excessive take-ups.



Tension-Cementing — replacing hand methods — applies the cement with perfect uniformity while belt is under working tension — for most uniformly high adhesive strength ever obtained in belting.

GRATON & KNIGHT COMPANY

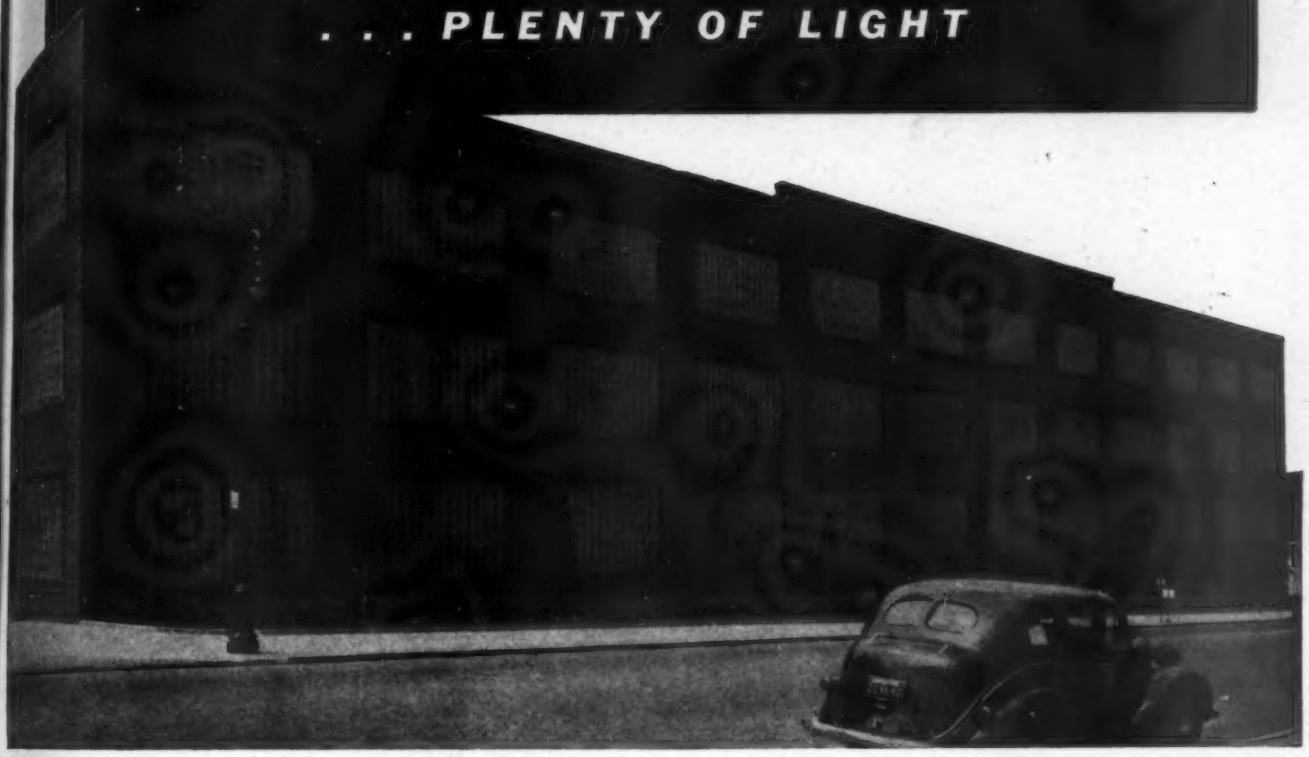
WORCESTER 4, GRATON AND KNIGHT MASS.

Graton & Knight is the only leather belting manufacturer with complete nationwide service facilities. Branches in Chicago, Cleveland, Dallas, Detroit, Kansas City, Minneapolis, New York, Philadelphia, St. Louis, San Francisco; distributors in all industrial centers.

Look under "Graton & Knight" in Belting section of Classified Telephone Directory or THOMAS' REGISTER.

No dirt or outside noise through PC Glass Block Panels

. . . PLENTY OF LIGHT



IN war plants such as this, where precision machines demand complete protection from dangerous grit and dirt, where hairline tolerances demand plenty of clear diffused daylight in workrooms, PC Glass Blocks have proven uniformly successful. The glass block light-transmitting panels are tight and dirt proof.

In addition, the factory lighted by PC Glass Block panels has these advantages: Lower heating costs in cold weather, less load on air-conditioning equipment, thanks to the high insulating value of glass block panels; less objectionable noise transmitted into or out of the plant; quick and easy cleaning; reduction of sash maintenance and replacement, all resulting in savings of trouble and expense.

In this plant, delicate precision machines help make instruments for our fighting flyers. It is located on the noisy main line of a busy steam railroad, subject to constant drift of cinders and flying gritty dust from roadbed ballast. To prevent infilteration of powdery grit—which would ruin the machinery and its precision products—to prevent outside noises from distracting skilled workers, the owners installed PC Glass Blocks, which solved the problem to their entire satisfaction.

We shall be glad to send you full information about PC Glass Blocks. Our free book, tells why they have scored outstanding successes in so many industrial buldings. Just fill in and mail the convenient coupon.

PITTSBURGH PC CORNING

GLASS BLOCKS

Distributed by

PITTSBURGH PLATE GLASS COMPANY

and by W. P. Fuller & Co. on the Pacific Coast

Pittsburgh Corning Corporation
2049-4 Grant Building, Pittsburgh, Pa.
Please send me your free book on PC Glass Blocks. It is understood that I incur no obligation.

Name .....

Address .....

City ..... State .....

750 Ton Flapjack!

HISTORY was made when the destroyer escort, U.S.S. *Bunch,* was "rolled over" successfully at the Defoe Shipbuilding yards at Bay City, Michigan. For this was the first time a steel-welded ship more than 300 feet long and weighing over 700 tons had been built upside down.

The same engineering feat that made it possible to build the U.S.S. *Bunch* in record time is producing an ever increasing fleet of sister ships—many of which are already in service on the high seas.

Defoe's unique "flapjack trick" with ocean-going warships does away with conventional ship scaffolding and allows workers to stand over their job at all times. Defoe construction methods deliver *twice the production per man hour* resulting in *double the number of ships* built at *half the labor cost per vessel.*

Resourcefulness in developing new methods and shortcuts to speed delivery of ships to the Navy is typical of Defoe engineering tradition. And when our fighting men and their allies have dealt a knockout to the Axis, the same competitive spirit, skilled workmanship and "know how" that are now setting records in producing for Victory, will be reflected in even greater values of Defoe products to serve peacetime America.

★ ★ ★

"Next to our immediate task of building warships faster and faster, the first responsibility of Defoe is to plan for post-war operation that will provide the maximum of gainful employment."

HARRY J. DEFOE
Founder Defoe Shipbuilding Co.

BACK THE ATTACK—BUY WAR BONDS
Defoe Workers take more than 10% of their pay in War Bonds

DEFOE SHIPBUILDING COMPANY, BAY CITY, MICHIGAN

Three White Star Renewal Citations now decorate the Navy "E" Award won by Defoe workers.

Defoe

Ships for Victory
Servants for Peace

.040ST Aluminum stitched to .032ST Aluminum
Rubber stitched to .040ST Aluminum
Fabric stitched to .040ST Aluminum
.032ST Aluminum stitched to linen fabric
MORRISON

Stitching

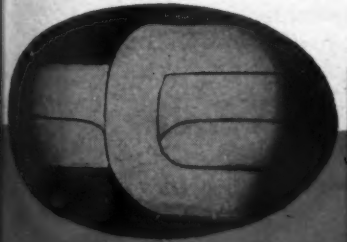
SAVES MANPOWER IN AIRCRAFT ASSEMBLY

One man doing the work of *seven* with use of only half the material . . . those are the mathematics of one particular application of the Morrison Aircraft Metal Stitcher!

In addition, many costly operations requiring the use of highly skilled workers are eliminated. Morrison Stitchers call for no special skill of any kind and require only one operator.

And as for this method of fabrication, it's proven, versatile and fast. Research testings show higher strength and longer life for Morrison — stitched assemblies in a wide variety of assemblies. If you are assembling or fabricating applications of Aluminum, Stainless Steel, Plastics, Cork, Rubber, Asbestos, Wood or Textiles — or any combinations of these materials —investigate Morrison Stitchers. Write for Bulletin F1.

★ BUY MORE WAR BONDS ★



Actual photograph, magnified several times, of cross section of stitch driven through two sheets of .040 24 ST Aluminum.

MORRISON

PRODUCTS OF THE SEYBOLD DIVISION
HARRIS-SEYBOLD-POTTER COMPANY
DAYTON F7, OHIO

STITCHERS

Take a Look at TOMORROW— *Today!*

"That's certainly a good looking motor—and well protected against anything that might fall on it."

"Yes, and that's not all. Its smooth operation helps to maintain the accuracy of this shaper."

The *Extra Protection* of CENTURY FORM J MOTORS Means Long, Uninterrupted Production Life

Inside and out, the Century Form J Motor has many features that contribute to longer motor life and more accurate performance of the driven machine. The upper half of the motor is closed—protecting it against falling solids and dripping liquids—helps keep out dirt, chips, cutting oils, tools, etc. Its smooth, well-proportioned contours make it easy to keep clean, as well as easy to look at.

The Century Form J Motor is unusually free from vibration, which is important to quietness, accuracy, and precision of the machine on which it is mounted. This lack of vibration is due to many design features which include: mechanical and electrical balance, rugged cast frames, extreme rigidity, accurately machined feet. A very effective ventilation system keeps the bearings and windings cool — adds extra life.

The Form J Motor is only one of a wide range of motor types and sizes, from fractional to 600 horsepower, available from Century.

Today—and tomorrow, it will pay you to remember Century Motors for all your electric motor requirements.

CENTURY ELECTRIC CO.
1806 Pine Street St. Louis 3, Missouri

Offices and Stock Points in Principal Cities

© Century Electric Company, 1944.

352

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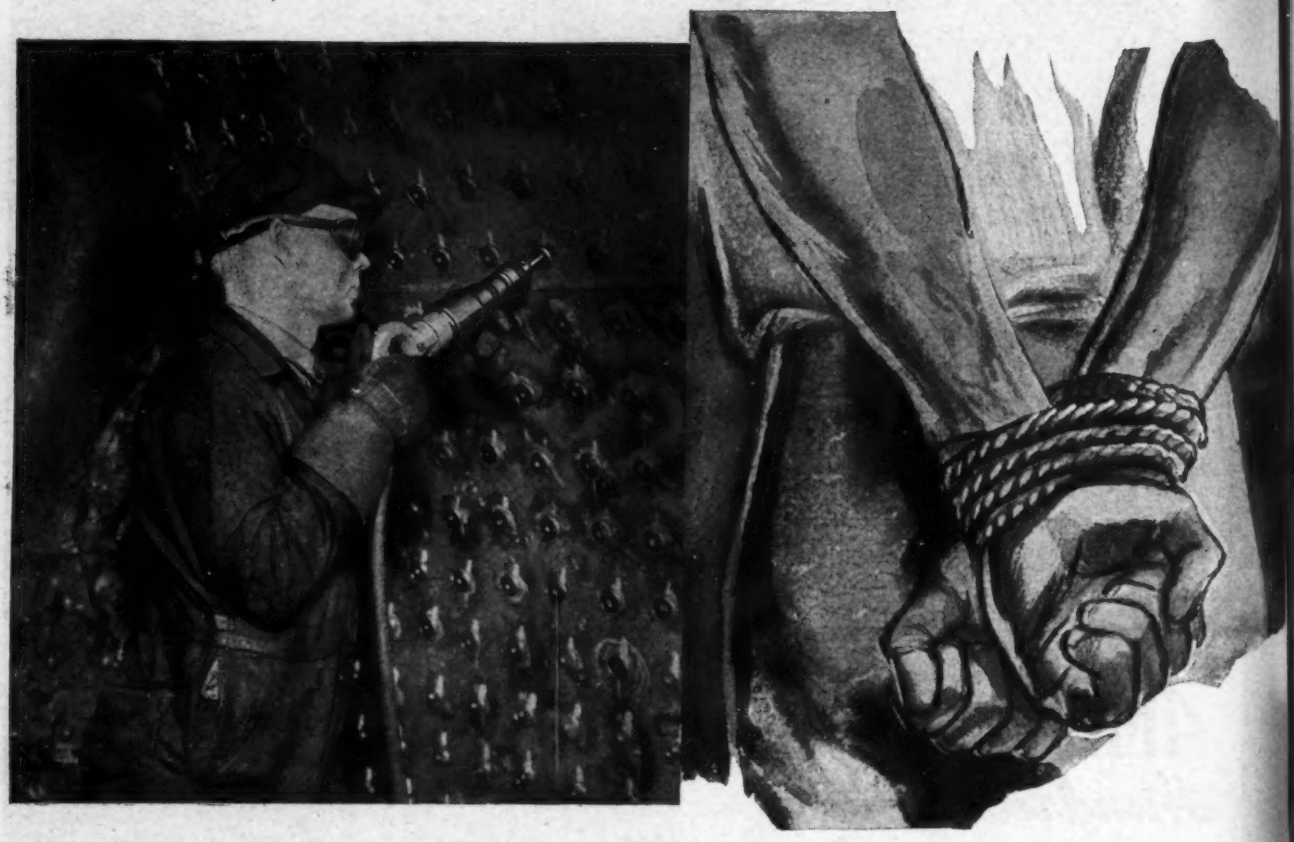
Hundred Series
DIAL INDICATORS
In four sizes with fourteen different dial graduations, indicating thousandths, half-thousandths or tenths of thousandths inches.
Speedy, accurate, inexpensive and adaptable to various measuring and testing jobs.
Write today for catalog.
B. C. AMES CO.
WALTHAM, MASS., U.S.A.

DON'T TIE HIS HANDS

with heavy, unwieldy tools



GIVE HIM *Lightweight* AIR TOOLS

He'll Produce More Work With Less Effort

Operators have the desire to produce. Therefore the *tool,* the medium by which their desire and energy is transformed into actual work, becomes the all-important item in final production. This means that you should select the tool that will enable them to convert their maximum physical energy to output with the least fatigue.

Running a hand-held machine, day after day, certainly justifies the choice of a lightweight *air* tool—because the reduction of fatigue is a very important factor in maintaining and increasing production.

Modern *air* tools are as much as 50% lighter in weight than other portable tools of comparable power—as much as 50% smaller in size. Their simplicity of design has made possible these important features without sacrificing durability and safety.

Choose from the complete line of Ingersoll-Rand *air* tools. If you wish, a Service Engineer will gladly call and assist you with your *air* tool problems.

Ingersoll-Rand

11 BROADWAY, NEW YORK 4, N. Y.

8-351

COMPRESSORS • TURBO BLOWERS • ROCK DRILLS • AIR TOOLS • OIL AND GAS ENGINES • CONDENSERS • CENTRIFUGAL PUMPS

MAHON Hydro-Flo

INDUSTRIAL WASHING MACHINES

FULL COVERAGE-3 WAYS

FULL COVERAGE CLEANING... Any part or product—regardless of size, shape or irregularity of surface—can be thoroughly cleaned in a Mahon Hydro-Flo Washing Machine. With the Hydro-Flo method, the cleaning solution is directed against the part to be cleaned in a series of jets or sprays, so adjusted as to strike the part from every possible angle—top, sides and bottom. This complete cleaning action insures an absolutely clean metal surface for the reception of paint or other finishing processes.

FULL COVERAGE OF OPERATING MECHANISM... All working parts — conveyors, pumps, sprays, solution tanks and piping—are enclosed in a cabinet of modern design, yet are quickly and easily available through ample openings that permit access without cramping. Any type of conveyor may be incorporated—overhead, floor, slat-belt or mesh-apron—whichever is most suitable. Operation of all mechanisms is entirely automatic.

FULL COVERAGE OF SIZES AND TYPES... Each Mahon Hydro-Flo Washing Machine is individually designed and built around the part to be cleaned—there are no *standard* types or sizes. Mahon engineers carefully study the job to be done and then develop a machine to exactly fit your purpose and your finishing production line—a machine you can safely rely upon for fast, efficient service—at a saving.

THE R. C. MAHON COMPANY

DETROIT — CHICAGO

Designers and Manufacturers of Metal Cleaning Machines, Rust Proofing Machines, Hydro-Filter Spray Booths, Ovens of All Types, Filtered Air Supply Systems, Hydro-Foam Dust Collectors—and Many Other Units of Special Production Equipment—Including Complete Finishing Systems.

SHORTS STYMIED

Voltage surges which accompany switching and frequent starting and stopping of motors impose high dielectric stresses on the coil insulation, and can cause harmful short circuits. Yet this is an unavoidable condition of service for many motors.

The grinder shown here, for example, starts and stops every time a finished part is removed and a new part inserted. But the two Tri-Clad motors that drive it have been built to withstand safely the voltage surges ordinarily encountered in this type of service. Their ability to "stymie" shorts was proved by the new *General Electric test* described below.

External grinder, equipped with two Tri-Clad motors, installed in the milk-machinery manufacturing plant of the Rite-Way Products Company, Chicago, Ill.

New high-potential, electronic surge-tester verifies strength of TRI/CLAD motor windings

This electronic test of insulation makes a "cardiogram" of every Tri-Clad motor winding, ferreting out weaknesses that might lead to shorts caused by voltage surges in service. It tests each turn, coil, and phase group of the windings for adequate insulation strength to withstand the "steep front" high-voltage surges of actual service. First developed and applied by G.E., it's one of the production tests which all Tri-Clad motors must pass as they come off our production lines. — *General Electric Company, Schenectady, N. Y.*

GENERAL ELECTRIC

Each week 192,000 G-E employees purchase more than a million dollars' worth of War Bonds.

TRI/CLAD MOTORS

REMEMBER . . .

THERE ARE MILLIONS OF WOMEN TO CONSIDER . . .

VICTORY hinges on production. And more working days every week, longer working hours each day call for executive consideration of *all* factors that will improve worker morale and thus increase production. For example . . . plant lavatories, washrooms, showers and dispensaries never improve tempers when these facilities are outmoded, inadequate, unsightly.

Nor can such facilities serve today's millions of women workers, or contribute to their first aid and safety protection, if interiors of the rooms are not finished in keeping with their functions. Modern Marlite wall paneling is perfectly suited to *your* special-purpose interiors. And in many other ways Plastic-finished Marlite is ideal for these interior walls. Moderate in cost, easy to install and easy to clean, it provides modern, practical and fast installations. High-heat-bake finish withstands hard and continuous use. Marlite plain-colors, tile-patterns, marble-patterns and genuine wood-veneers are equally suitable for factory reception and recreation centers, meeting rooms, first aid stations, offices, laboratories and cafeterias.

WRITE TODAY . . . for complete information and samples. Stocks of Marlite are ready for quick delivery from a nearby warehouse to *all* plants where war production provides suitable priorities. Marsh Wall Engineers will be glad to work with you.

HIGH-HEAT-BAKE-FINISH was pioneered by Marlite. This practical surface assures years of service at many strategic factory points by providing a wall which withstands the action of most chemical fumes, as well as scuffs and mars . . . a wall that takes frequent washing with chemical disinfectants and strong soap without chemical change . . . a wall that eliminates dirt pick-up and glare in workers' eyes.

Marlite

REG. U. S. PAT. OFF.

MARSH WALL PRODUCTS, INC. • 450 MAIN ST. DOVER, OHIO

SHE SIMPLY GUIDES AS THE LOAD RIDES

Automatic TRANSPORTER

NO STRAINING--TUGGING--PULLING NOR PUSHING

•

POSITIVE MECHANICAL BRAKE--CONTROLS IN STEERING HANDLE--FORWARD AND REVERSE SPEEDS--FRONT WHEEL POWER DRIVE--SHOCKLESS HYDRAULIC PLATFORM LIFT WITH EASY FOOT CONTROL

• *Miss War Worker and a* TRANSPORTER *can transport the same tonnage of material a given distance that would require the physical effort of three men handling in the conventional way.*

• *The* TRANSPORTER *is built in 4000- and 6000-pound capacity platform type lift trucks for skid transportation and in a pallet type fork lift truck for unit loads up to 4000 pounds on open- or double-faced pallets.*

★ Miss War Worker, whose job it is to transport materials, becomes a high efficiency employee with a TRANSPORTER. Her work consists only of guiding the TRANSPORTER and walking along with the load. This mechanized material-handling truck transports tons of bulk material of various sizes and shapes, or packaged products, doing all the heavy work and accomplishing it quickly and at low cost.

The TRANSPORTER is designed for short hauls within the plant — it handles loads in elevators, along narrow aisles, and is valuable for use in areas where floor loads are restricted. Get details on this modern material-handling truck that has the forward and reverse control buttons in the handle for easy guiding of loads.

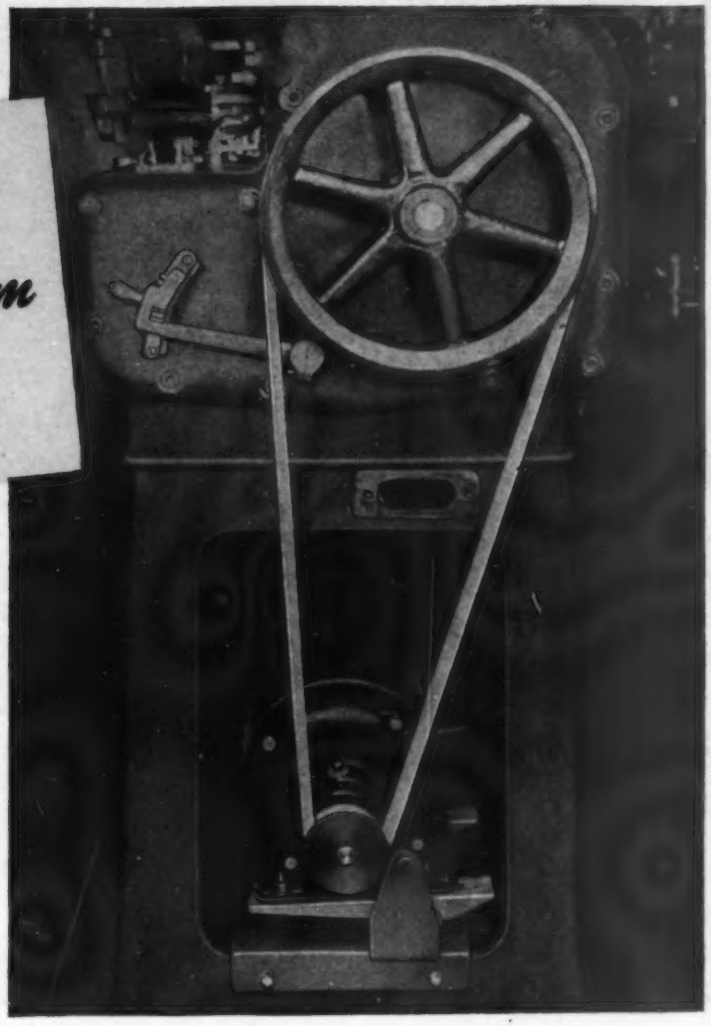
MANUFACTURERS FOR OVER THIRTY FIVE YEARS *Electric Propelled* INDUSTRIAL TRUCKS

AUTOMATIC TRANSPORTATION CO.

DIV. OF THE YALE & TOWNE MFG. CO.

39 WEST 87th STREET CHICAGO 20, ILLINOIS

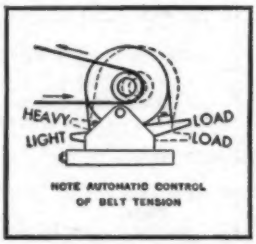
HOW TO SOLVE THE *Belt Tension Problem* IN YOUR PLANT



SINCE the productive efficiency of any belt-driven machine depends largely on the efficiency and trouble-free operation of the drive, *belt tension* is a problem in every plant.

When belts are not tight enough, they slip. As a result, machine R.P.M. are lost and output reduced. When belts are too tight—wear on belts and bearings is excessive. This results in machine shutdowns due to drive failure, with consequent costly interruptions to production.

American Econ-o-matic Drives solve these belt tension problems. By utilizing the torque reaction of the motor, belt tension is *automatically* matched to the load. On a heavy load, belt tension is increased. On a light load it is reduced. No slide rails, no idlers to adjust—*it's automatic!* Belt slip is eliminated. Belt and bearing life is increased. Maintenance man-hours reduced by as much as 75%. And machine output increased as much as 15%.



NOTE AUTOMATIC CONTROL OF BELT TENSION

There is only one way to get *automatic* belt tension control—specify American Econ-o-matic Drives. Write today for your copy of the Econ-o-matic Handbook. It gives you complete drive tables, specifications and installation instructions.

Output Jumps 15% for this Candy Company

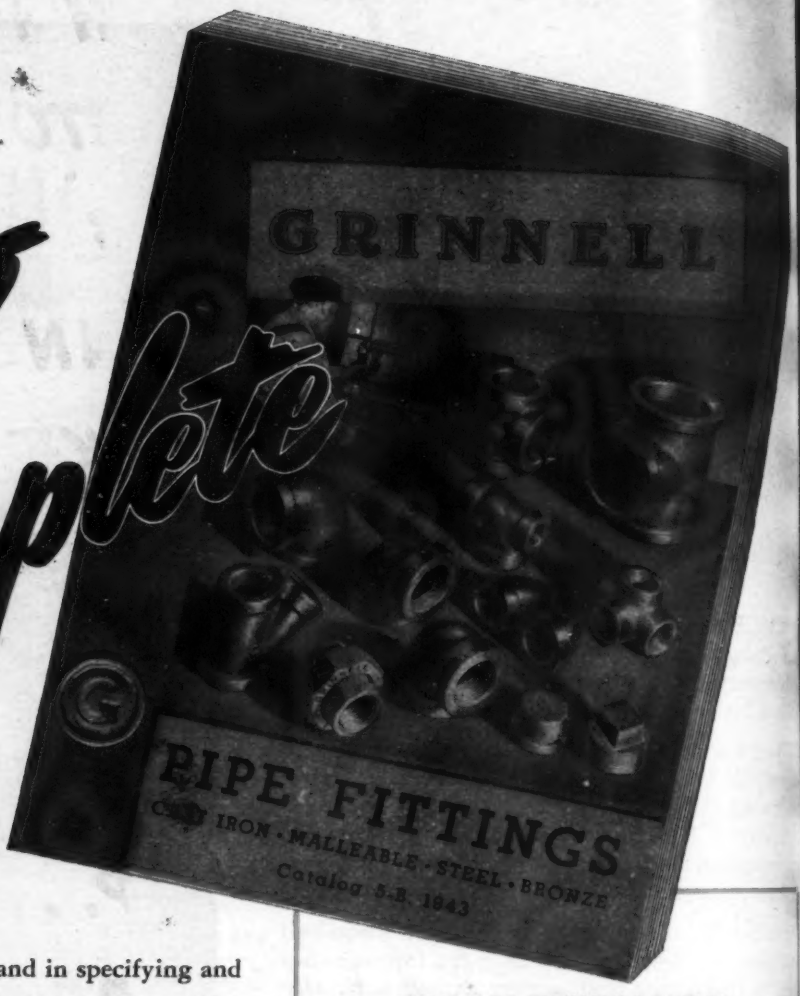
This cutting-and-wrapping machine had to be stopped 10 times daily for reloading. Starting load is 75% over normal. Belts and bearings wore out rapidly due to high overload tension. Now—this manufacturer reports—by equipping his 50 machines with American Econ-o-matic Drives, belts take high starting load readily without slip. Belt and bearing life increased . . . maintenance costs dived considerably . . . and production zoomed 15%!

The American Pulley Company
4208 WISSAHICKON AVE., PHILADELPHIA, PA.

WEDGBELT SHEAVES

American Wedgbelt Sheaves are made to the highest precision standards. They are made of sound, strong metal, accurately machined, finely finished and carefully balanced.

It's New
It's Complete



To help you with your piping layouts and in specifying and ordering pipe fittings for any requirement, Grinnell offers this new, complete catalog.

It includes detailed information, list prices, materials, dimensions and service pressures for Grinnell's complete line of cast iron, malleable iron, steel and bronze fittings.

For prompt service in procuring a copy, write or phone your nearby Grinnell office listed below.

TYPES OF FITTINGS LISTED

			w.s.p.
CAST IRON,			
	Screwed —		
		Standard	125 lbs.
		Extra Heavy	250 lbs.
		Sprinkler	175 lbs.
		Drainage	
	Flanged —		
		Standard	175 lbs.
		Extra Heavy	250 lbs.
MALLEABLE IRON,			
	Screwed —		
		Standard	150 lbs.
		Extra Heavy	300 lbs.
		AAR	300 lbs.
		Plain	
		Railing	
STEEL,			
	Screwed —	Wrought (Nipples & Colgs.)	
		Cast —	1000 to 2000 lbs.
		Forged —	2000 to 6000 lbs.
		(also flanges)	
	Flanged —		
		Cast	150 to 1500 lbs.
BRONZE,			
	Screwed —		
		Standard	125 lbs.
		Extra Heavy	250 lbs.

MISCELLANEOUS SUPPLIES

GRINNELL

WHENEVER **PIPING** IS INVOLVED

GRINNELL COMPANY, Inc.
Executive Offices, Providence, Rhode Island

ATLANTA 2, GA.
240 North Highland Avenue, N. E.

CHARLOTTE 1, N. C.
1431 West Morehead Street

CHICAGO 9, ILL.
4425 South Western Avenue

CLEVELAND 14, OHIO
1294-6 East 55th Street

HOUSTON 1, TEXAS
1121 Rothwell Street

MINNEAPOLIS 15, MINN.
240 Seventh Avenue, South

NEW YORK 17, N. Y.
347 Madison Avenue

PHILADELPHIA 34, PA.
Erie Avenue and D Street

PROVIDENCE 1, R. I.
260 West Exchange Street

ST. LOUIS 10, MO.
1140 Central Industrial Avenue

ST. PAUL, MINN.
194 West Fourth Street

WARREN, OHIO
Dana and Paige Avenue

LOS ANGELES 13, CALIF.
520 Mateo Street

OAKLAND 7, CALIF.
2230 Peralta Street

SAN FRANCISCO 7, CALIF.
601 Brannan Street, cor. Fifth

SEATTLE 1, WASH.
3101 Elliott Avenue, cor. Bay Street

LAST MONTH HE WAS SANTA IN THE TOY STORE

THIS MONTH HE TOOK HIS

GRANDSON'S PLACE

AND HE'S DRIVING SCREWS LIKE A 21-YEAR OLD.

FOR THE PLANT WHERE HE WORKS USES THE RECESSED HEAD SCREW

THAT MAKES DRIVING DUCK SOUP...

IT'S PHILLIPS ➡➡➡➡

THE ENGINEERED RECESS

Anyone can drive Phillips Screws! Today, screw driving is one production job anyone can tackle without any special talent or training. The job that once called for strong arms and skilled hands now is a cinch for the operator who never tackled a screw driving job before!

It's the Phillips Recessed Head Screw that does the trick! With Phillips Screws, the greenest operator quickly becomes as skillful as a veteran. No fumbling . . . no wobbly starts . . . no slant-driven screws or dangerous screw driver skids. Workers turn out flawless jobs every time — and faster than ever before. Time studies prove that Phillips Recessed Head Screws step up screw driving speed as much as 50 per cent!

Imagine what this means to you in terms of man-and-training-hours saved . . . of increased production . . . finer workmanship. Then match these important advantages against slotted head screws — or any other type you may be using.

PHILLIPS *Recessed Head* SCREWS

WOOD SCREWS · MACHINE SCREWS · SELF-TAPPING SCREWS · STOVE BOLTS

TO MAKE WARTIME QUOTAS AND PEACETIME PROFITS

Faster Starting: Driver point automatically centers in the Phillips Recess . . . fits snugly. Fumbling, wobbly starts, slant driving are eliminated. Work is made trouble-proof for green hands.

Faster Driving: Spiral and power driving are made practical. Driver won't slip from recess to spoil material or injure worker. (Average time saving is 50%.)

Easier Driving: Turning power is fully utilized. Workers maintain speed without tiring.

Better Fastening: Screws are set-up uniformly tight, without burring or breaking of screw heads. The job is stronger, and the ornamental recess adds to appearance.

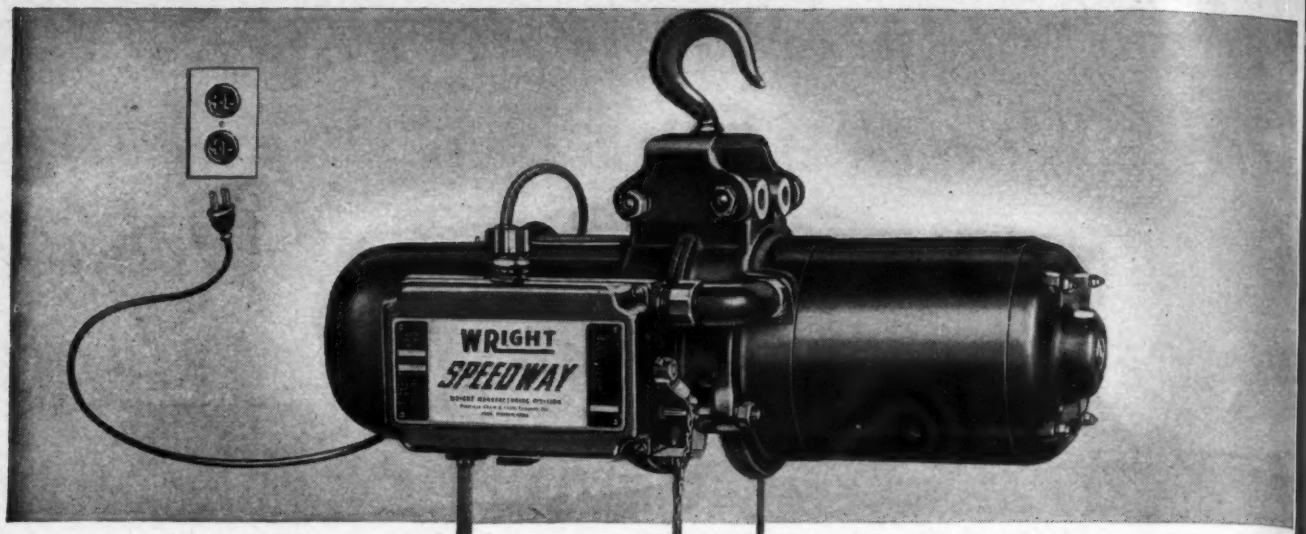
IDENTIFY IT!

Center corners of Phillips Recess are rounded . . . NOT square.

Bottom of Phillips Recess is nearly flat . . . NOT tapered to a sharp point.

23 SOURCES

American Screw Co., Providence, R. I.
The Bristol Co., Waterbury, Conn.
Central Screw Co., Chicago, Ill.
Chandler Products Corp., Cleveland, Ohio
Continental Screw Co., New Bedford, Mass.
The Corbin Screw Corp., New Britain, Conn.
General Screw Mfg. Co., Chicago, Ill.
The H. M. Harper Co., Chicago, Ill.
International Screw Co., Detroit, Mich.
The Lamson & Sessions Co., Cleveland, Ohio
Milford Rivet and Machine Co., Milford, Conn.
The National Screw & Mfg. Co., Cleveland, Ohio
New England Screw Co., Keene, N. H.
The Charles Parker Co., Meriden, Conn.
Parker-Kalon Corp., New York, N. Y.
Pawtucket Screw Co., Pawtucket, R. I.
Pheoll Manufacturing Co., Chicago, Ill.
Reading Screw Co., Norristown, Pa.
Russell Burdsall & Ward Bolt & Nut Co., Port Chester, N. Y.
Scovill Manufacturing Co., Waterville, Conn.
Shakeproof Inc., Chicago, Ill.
The Southington Hardware Mfg. Co., Southington, Conn.
Whitney Screw Corp., Nashua, N. H.



A

MASTER-PIECE

FOR

increased production

ACCO
TRADE MARK

In Business for Your Safety

● The period of hurry—the need for faster production—won't be over with the war. Post-war work will impose its demands too. Get an Improved WRIGHT *SPEEDWAY* Electric Hoist as soon as possible for both now and tomorrow. Because it speeds up work and makes jobs easier, WRIGHT'S *SPEEDWAY* saves labor time, cuts handling costs—quickly pays for itself.

Women workers in war plants especially appreciate the push-button ease with which the WRIGHT *SPEEDWAY* is operated. The *SPEEDWAY* helps them maintain their morning vigor throughout the afternoon.

The *SPEEDWAY* Electric is a sturdy, light weight, cable hoist, designed for fast lifting on assembly floors and for general use. Designed with spur gear construction, magnetic control, and mechanical features found only in the more expensive production-type hoists. Yet it is priced economically low.

Talk to your WRIGHT distributor about *SPEEDWAY*'s advantages. He is listed in your classified telephone directory.

WRIGHT MANUFACTURING DIVISION
York, Pa., Chicago, Denver, Los Angeles, New York, Portland, San Francisco

AMERICAN CHAIN & CABLE COMPANY, INC.
BRIDGEPORT, CONNECTICUT

ARMY E NAVY
FLYING OVER THE WRIGHT HOIST PLANT

WRIGHT *SPEEDWAY* HOISTS

Who can use this after the war?

So far this is definitely a war baby. It was born to meet an exacting wartime need. Every one that is made goes right into the fight.

It is an electric motor designed for jobs which no regular electric motor could fill.

The jobs are on America's fighting planes. Working control flaps—opening and closing cooling shutters—lifting landing gears—and the like.

Every ounce on an airplane is precious. So usual electric motors were out.

This one weighs as little as 8/10ths of a pound—others can move as much as 35 tons.

Naturally it took a whole new kind of engineering to make this motor.

It took new ideas from the drawing board up. It took new materials—like glass-insulated wire—to build it. It required finer, more precise craftsmanship than had ever gone into a motor before.

After the war, these motors can be sold to manufacturers of peacetime products.

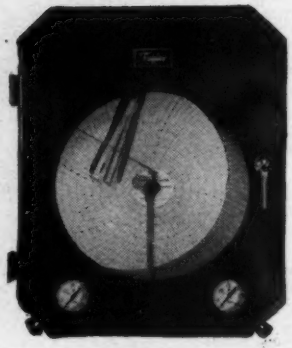
That is why we are telling you about them now.

You may have need for such a compact, ultra-efficient source of power. You may be able to use the kind of engineering thinking that developed it—or the production technique that builds it and about 250 other Lear products.

PLANTS: Piqua, O., and Grand Rapids, Mich. BRANCHES AT: New York, Los Angeles, Chicago, Detroit, Cleveland, Providence.

LEAR AVIA INC.
PIQUA · OHIO

FOR SALE



Taylor Fulscope Controllers

PROMPT DELIVERY – WE'RE READY!

THIS is no post-war pipe-dream. We can assure normal delivery schedules *right now!*

In spite of—or more correctly because of—the fact that Taylor has been one of the main suppliers of instruments for high octane gasoline, synthetic rubber, butadiene, styrene, toluene, and alcohol, our production is now in high gear and *we are ready for new orders!*

Do you need Taylor Instruments for alkylation? Cat cracking? Isomerization? Dehydrogenation? Or other similar continuous processes? *We can supply them!*

Ask your Taylor Field Engineer NOW for the instruments that have been tried and proven in all these processes—the instruments that mean "Accuracy First!" Taylor Instrument Companies, Rochester, N. Y., and Toronto, Canada. *Instruments for indicating, recording, and controlling temperatures, pressure, humidity, flow, and liquid level.*

TAYLOR REPAIR SERVICE

We can now give the same prompt service as on new instruments. We have complete repair facilities at Rochester, Tulsa, and San Francisco, also in Toronto.

ARMY E NAVY

Taylor Instruments

MEAN

ACCURACY FIRST

IN HOME AND INDUSTRY

★ KEEP ON BUYING U. S. WAR BONDS AND STAMPS ★

Prevent Valve Failure *before it starts!*

SEDIMENT SMOTHERS WORKING PARTS...

. . . speeds destructive wear in "Upside Down Valves"

Valves have no "upside-down stomach" to digest and dispose of destructive sediment. Because most valves are designed for upright installation, the inverted position invites a wide variety of troubles – sticking, incomplete closure, rapid wear, leakage, and eventual failure.

To make sure of efficient and trouble-free operation, plan upright installation for every service, and turn up valves in present use wherever possible. Second best to an upright position is a slightly tilted position. When it is absolutely necessary to invert a valve, be sure it is the type best suited for such conditions, and make sure it gets frequent attention. In the case of larger valves, provide a drain or suitable clean-out for blow-off purposes.

Production delays due to valve failure retard the delivery of vital supplies needed to "back the attack." Many such failures can be prevented . . . by proper installation of valves, after careful selection of the proper type for the service . . . by regular, systematic inspection . . . by repair or replacement of worn parts . . . by thorough instruction of maintenance workers.

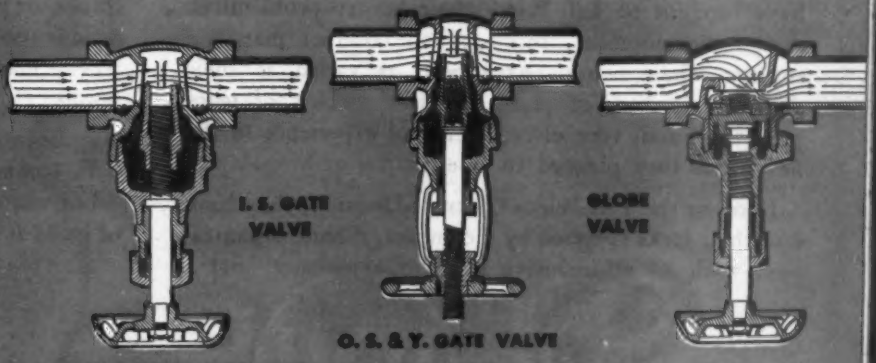
Consult Jenkins Engineers for any assistance you need in promoting valve conservation.

Jenkins Bros., 80 White Street, New York 13, N. Y.; Bridgeport; Atlanta; Boston; Philadelphia; Chicago. Jenkins Bros. Ltd., Montreal; London.

WHY INVERTED INSTALLATION STARTS VALVE "HEADACHES"

The destructive results of upside-down installation are illustrated in these sketches for three different types of valves. Similar troubles develop in other types when inverted.

1. When closing valve, sediment may stick to wedge faces, prevent tight closing, and cause progressive damage to seat.
2. Sediment accumulation prevents complete back seating necessary when repacking under pressure. Line must then be closed while repacking.
3. Sediment accumulates in threads on spindle and wedge, causes sticking and rapid wear of threads.
4. Bonnet becomes a sediment collecting chamber.
5. Sediment and liquid, seeping down between body and spindle, causes scoring and rapid wear of spindle.
6. Seepage through packing box of O. S. & Y. valve affects operating threads on spindle, causing seizure and destructive wear.
7. Foreign matter lodging on disc face of a globe valve prevents tight closing and accelerates disc wear.
8. Packing deteriorates rapidly and leakage affects spindle and handwheel.



JENKINS VALVES

For every industrial, engineering, marine and power plant service . . . in Bronze, Iron, Cast Steel and Corrosion-Resisting Alloys . . . 125 to 600 lbs. pressure.

Said the Hatter...

Gunmaker...

and Food-Packer...

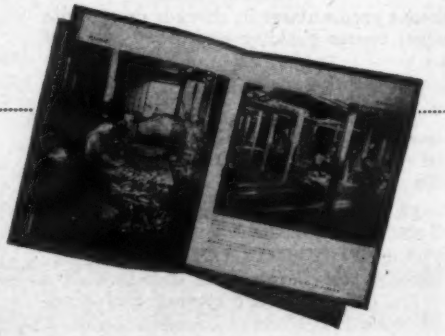
to the man with the *new-product headache:*

"TAKE IT TO TAFT-PEIRCE"

For nearly seventy years, scores of manufacturers in every line of industry . . . in peacetime and in war . . . have brought to Taft-Peirce their knotty problems in design, development, tooling, and contract manufacturing. Their reasons have been as varied as their products . . . lack of plant facilities . . . lack of manpower . . . and, very often, a lack of experience in the new fields they planned to enter.

Here, in the Taft-Peirce Contract Division, they have had their lacks supplied by a compact, mobile organization with an all-inclusive store of experience, and a plant equipped to produce *economically* anything from a single production tool to complete mechanisms, machines, or products in carload lots. No job is too large, none is too small, and any phase of Taft-Peirce Contract Service may be engaged without the others.

Today, the roster of Taft-Peirce contract clients has extended so widely that it has become almost a country-wide commonplace to advise: "If you have a good idea —but not the time or experience to develop, tool up, or build it—then *Take It To Taft-Peirce.*"



Taft-Peirce Contract Service...

is described and illustrated in this interesting gravure volume, a copy of which you may obtain by writing on your letterhead to: *The Taft-Peirce Manufacturing Co., Woonsocket, Rhode Island.*

HOW 17 MINUTES OF MUSIC STOPPED A PRODUCTION SLUMP

EVERY afternoon between 2:45 and 4:00 o'clock production took a nose-dive at one particular war plant. The reason: workers' nerves were getting on edge—fatigue was getting the best of them.

And then the management tried industrial music. A little in the morning—a little at noon—*and 17 minutes of it beginning at 2:45.* In less than 3 weeks, the production slump began to disappear—until it was finally gone. Now an even production level can be maintained—and workers feel better!

This is not an unusual case—similar results are being obtained in war plants all over the country.

The use of *planned* industrial music has helped to reduce Monday morning absences, to decrease petty ailments (headache, etc.) caused by "jangled nerves," to improve productive efficiency, and to improve morale generally. These are measured, *proved* results—results that can be *reproduced.*

Music can be used even in a noisy plant.

RCA Industrial Music Service offers you great flexibility—in timing, in selection of music, and in type of service. The Victor and Bluebird industrial library has been carefully selected from the vast RCA Victor treasure house of the world's best-loved music.

You also get the benefit of RCA psychological research in industrial music and its application.

The story of industrial music and what it offers you is told in the new book "Manpower, Music and Morale," sent free on request. Write for it today to: RCA, Dept. 70-29B, Camden, N. J.

FREE: This new 16-page book telling how to use music in industry, and what it can do for you. Ask for "Manpower, Music and Morale." Address: RCA, Dept. 70-29B, Camden, N.J.

RCA INDUSTRIAL MUSIC SERVICE

BUY MORE WAR BONDS

RADIO CORPORATION OF AMERICA

Consider these angles
when choosing a
Right Angle Drive

Philadelphia Worm Gear Speed Reducers have been the choice of many industrial plants because:

In those units are included practically every feature necessary for transmitting power efficiently, dependably, economically.

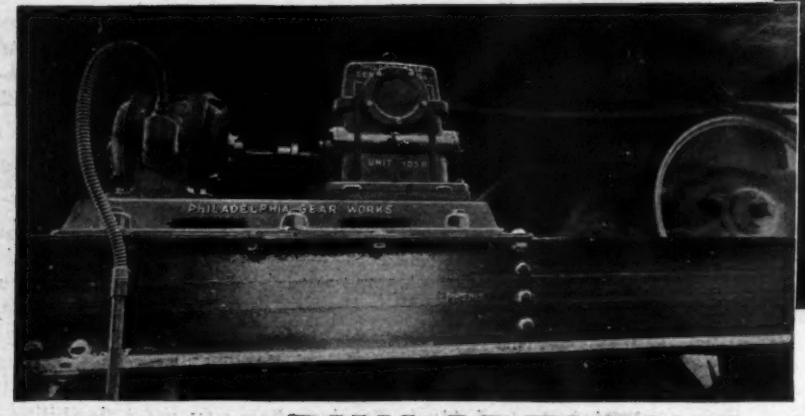
They have stamina aplenty for today's long continuous service.

Ample housings provide proper heat dispersal — cool running.

High operating efficiencies — up to 85% to 95% are obtainable.

Both horizontal and vertical types are available in wide range of horsepowers and ratios.

Get our catalog 25 for complete details on Philadelphia Worm Gear Reducers.



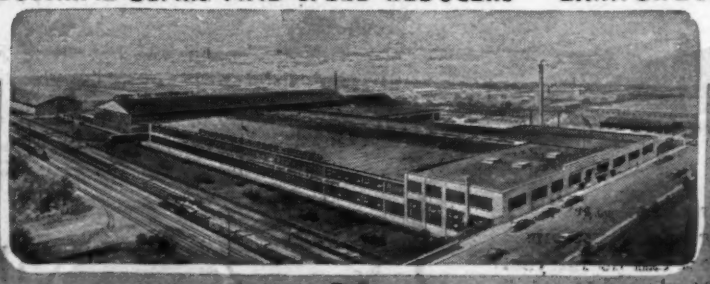
Left: A Philadelphia Worm Gear Speed Reducer driving a conveyor.

ARMY NAVY

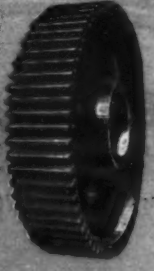
PHILADELPHIA GEAR WORKS, INC.

INDUSTRIAL GEARS AND SPEED REDUCERS LIMITORQUE VALVE CONTROLS

ERIE AVENUE & G STREET
PHILADELPHIA 34, PENNA.
NEW YORK, PITTSBURGH, CHICAGO



Philadelphia LIMITORQUE CONTROL operates all types of valves, etc., safely, economically, from convenient stations.



Philadelphia GEARS All types and sizes of industrial gears. Can be supplied in all materials.

Philadelphia HERRINGBONE SPEED REDUCER for heavy loads at high speed. Single, Double, Triple Reductions, various ratios and horsepowers.

Philadelphia MOTOREDUCER The economical self-contained drive. Horizontal or Vertical Types — various ratios and horsepowers.

Philadelphia WORM GEAR SPEED REDUCER right angle drives — vertical or horizontal. Wide range of ratios and horsepowers.

Best Sellers from Consolidated Steel

Pictured here are current Consolidated Steel Corporation best sellers—vital equipment produced for the armed services and essential industry in the amounts shown. (All figures estimated as of December 31, 1943.)

The diverse character of these products and the precision work involved represent scores of problems overcome, scores of new production techniques adopted. We are, naturally, proud of this array—a record in steel that has won for the men and women of Consolidated Steel every basic government industrial award.

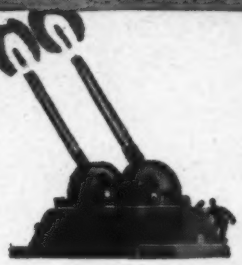
Consolidated craftsmanship, evidenced on this page, will return one day to the engineering and fabrication of *peacetime* best sellers—steelwork that will help to build and maintain America's leadership in the world of tomorrow.

Consolidated Steel

FABRICATORS
ENGINEERS
CRAFTSMEN

LARGEST INDEPENDENT IN THE WEST

CONSOLIDATED STEEL CORPORATION, LTD., LOS ANGELES, LONG BEACH, WILMINGTON, CALIFORNIA; ORANGE, TEXAS

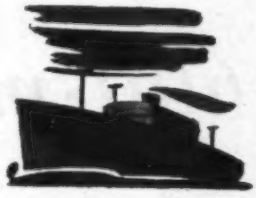


FOR THE NAVY: five-inch anti-aircraft guns. Built to tolerances of 2/10,000 in. Produced in the amount of $20,000,000.

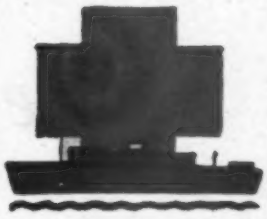
FOR THE MARINES: mechanized landing craft. Produced in the amount of $7,500,000.

FOR THE NAVY: destroyers, destroyer escorts and frigates. Produced in the amount of $295,000,000.

FOR THE ARMY: large infantry landing craft. Produced in the amount of $9,000,000.

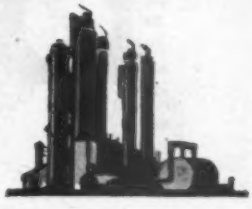


FOR THE MARITIME COMMISSION: 12,900-ton high-speed Merchant Marine (C-1) cargo and passenger ships. Produced in the amount of $175,000,000.

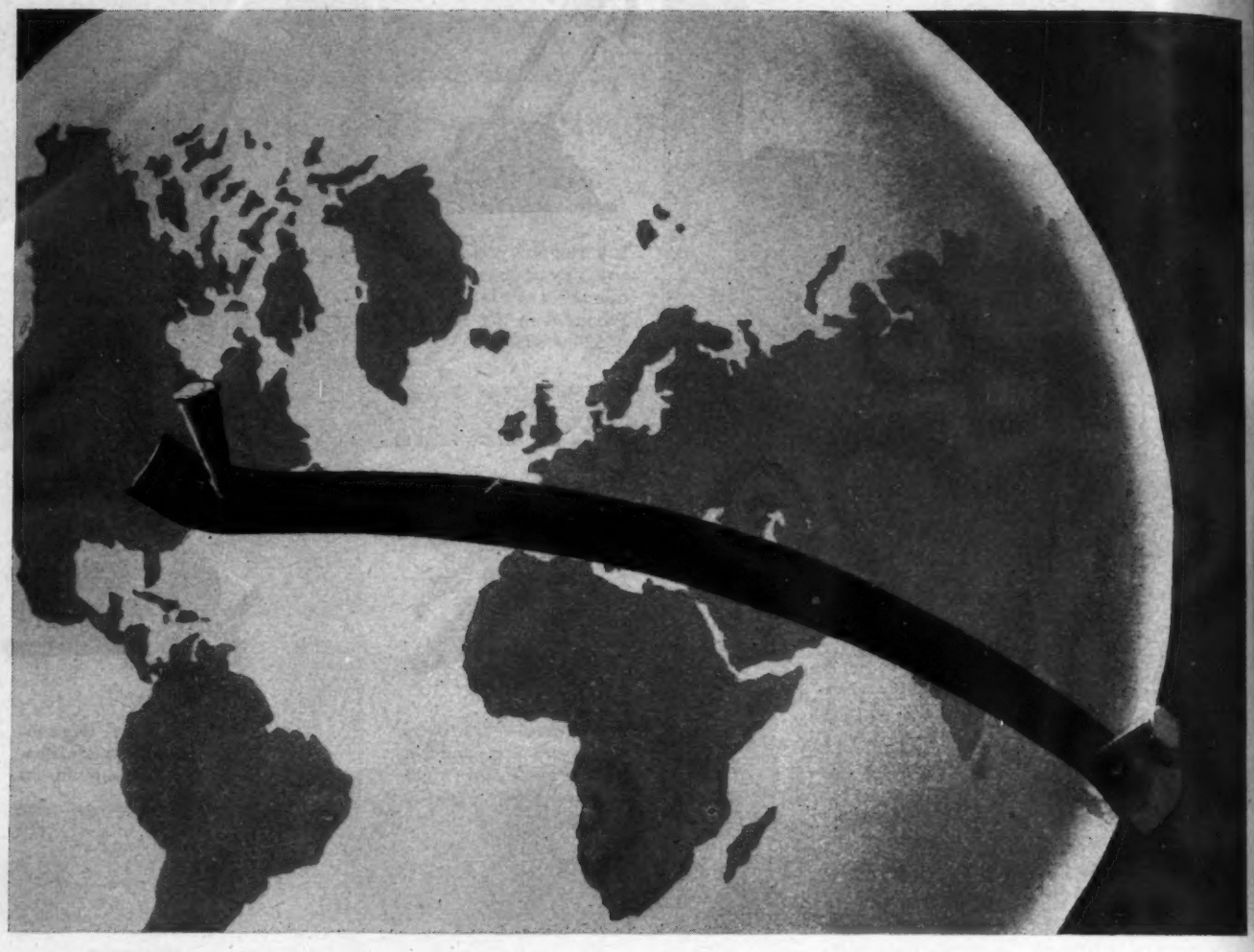


FOR THE NAVY: hospital ships and transports. Produced in the amount of $17,000,000.

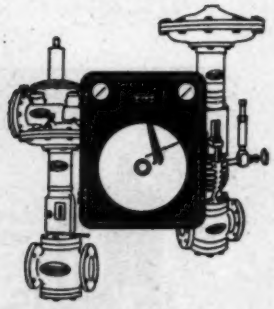
FOR AERONAUTICAL RESEARCH: wind tunnels including the world's highest speed wind tunnel as large as 16 feet throat diameter. Produced in the amount of $1,300,000.



FOR WAR INDUSTRY: the equipment for fuel, synthetic rubber and other war plants. Produced in the amount of $4,500,000.



The 10,600-mile stretch...



Before the Japs had conquered the East Indies, America's scientists and chemists planted miniature rubber plantations in the United States by creating synthetic rubber.

From Massachusetts, 10,600 miles away, came Masoneilan controls which made possible the processes which have enormously stepped up the production of rubber . . . American made rubber . . . and prevented the loss of Far East supplies from being a major disaster.

MASONEILAN

MASON-NEILAN REGULATOR CO.

1197 ADAMS ST., BOSTON, MASS.

New York Philadelphia Pittsburgh Tulsa Toledo Chicago
Atlanta St. Louis San Francisco Los Angeles Houston
Mason Regulator Co. of Canada, Ltd., Montreal, Canada

Tomorrow's equipment for TODAY!

HANSEN
INDUSTRIAL AIRLINE EQUIPMENT

In Hansen equipment you get advanced engineering, modern design and quality materials to meet the demands of today and tomorrow—SPEED, PRODUCTION, EFFICIENCY and ECONOMY.

For the past quarter of a century, Hansen Air Line Equipment has been the outstanding quality line, never built down to meet a price but always maintained at a high quality level.

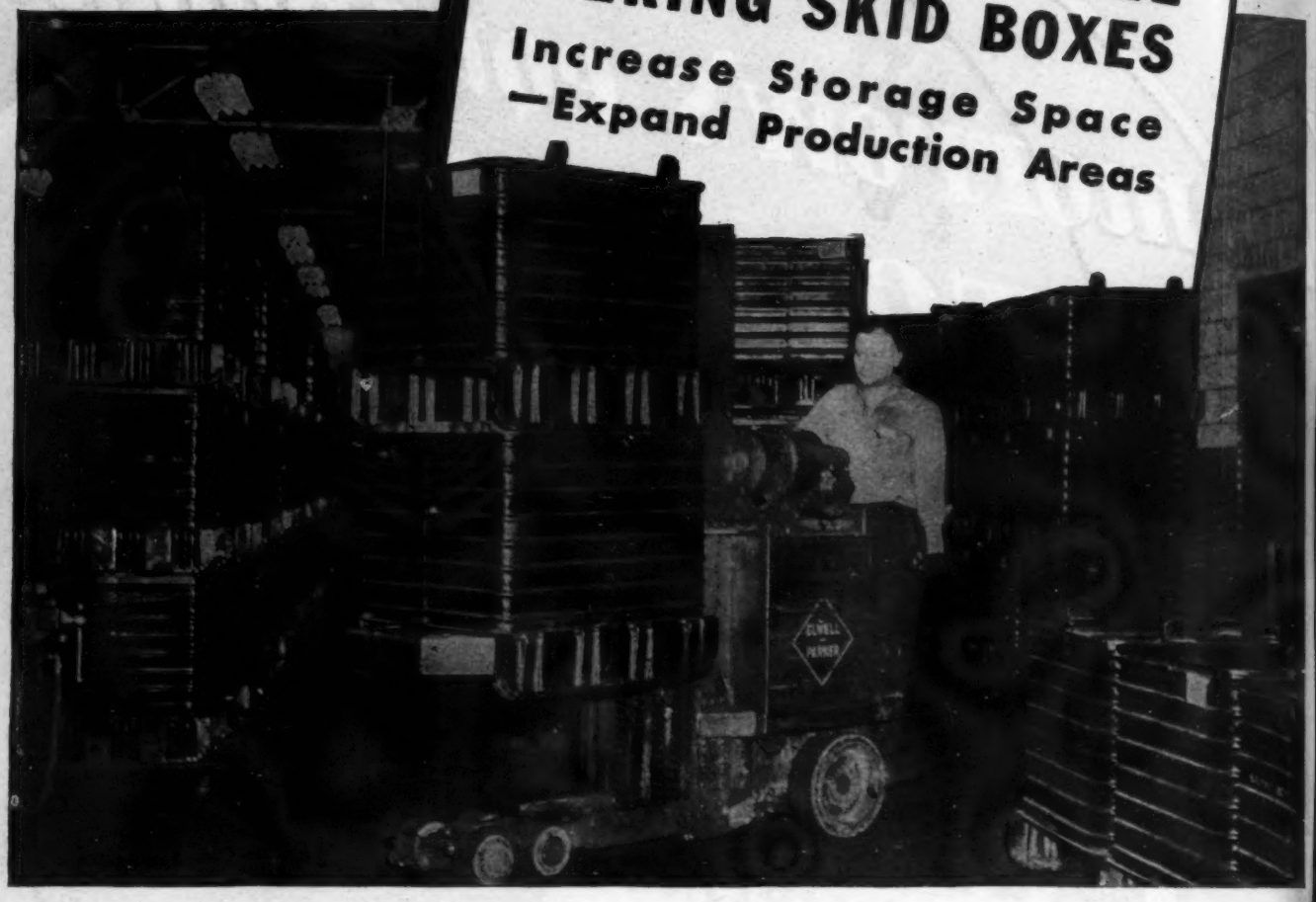
THE HANSEN MFG. CO.
1786 EAST 27TH STREET • CLEVELAND, OHIO

SAND BLAST CLEANER
AIR-LIQUID SPRAY GUN
HOSE CLAMP SOCKET
AIR HOSE COUPLING
BLOW GUNS
HOSE CLAMP PLUG
HOSE CLAMPS

Send for Free CATALOG

UNION METAL STEEL TIERING SKID BOXES

Increase Storage Space —Expand Production Areas



WOULD you like to increase the capacity of your present storage space—or convert part of it to a production area? You can do this easily and quickly through the use of Union Metal Steel Tiering Skid Boxes.

These sturdy, all-welded steel units can be tiered to any reasonable height—thus utilizing overhead space that may now be wasted. They are speedily handled with hand lift or power lift trucks, making them equally efficient for short spottings and long hauls.

Union Metal's complete line of steel boxes, skid platforms, and pallets offers a size and type to meet every materials handling requirement. Write for catalog.

UNION METAL

THE UNION METAL MANUFACTURING CO.

CANTON, OHIO

POWER IS OUR BUSINESS

POWER

Ready-Power manufactures a complete line of Power Units for: Industry • Transportation • Utilities • Construction • Agriculture • Oil Fields • Military and Naval Operations—and wherever electric power from Diesel gasoline or natural gas engines is needed. Since 1924, Ready-Power products have "covered the globe" and have built for Ready-Power in user satisfaction, a "reservoir of good will." Ready-Power is an Organization of Engineers with wide experience, modern plant facilities, and with pride in accomplishment. The Ready-Power Company likes their business — works hard at it and knows that by keeping faith, will continue to prosper.

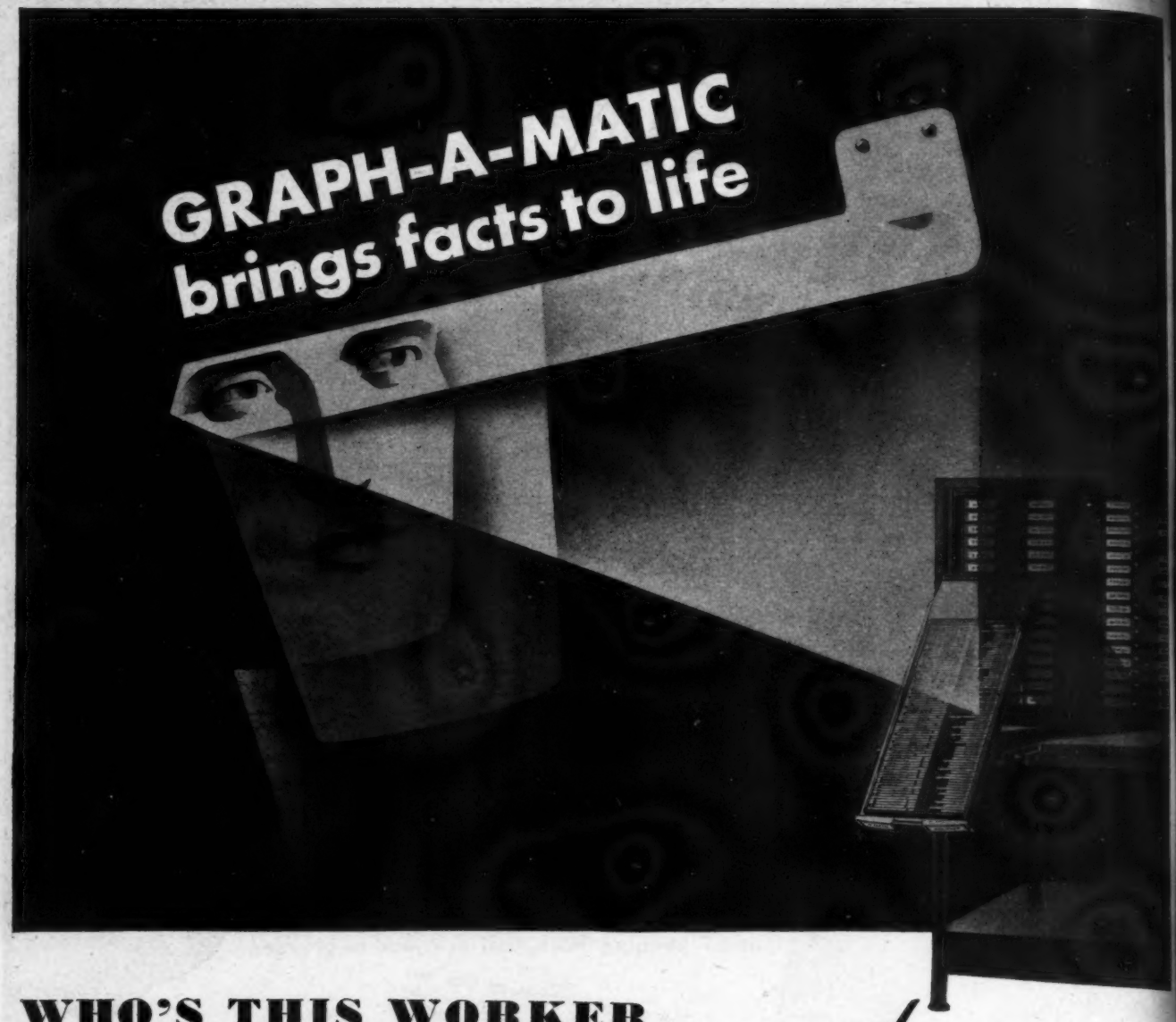
Manufacturers of Ready-Power Gas-Electric Power Units for the operation of electrical industrial trucks.

Ready-Power gasoline, natural gas and Diesel-engined electrical plants, switchboards, etc., for all power needs.

Ready-Power Mobile Power Plants "Power stations on wheels" for utilities, construction, etc.

THE READY-POWER CO.

GENERAL OFFICES: 3891 GRAND RIVER AVENUE, DETROIT 8, MICHIGAN



WHO'S THIS WORKER offering you *balanced* production?

Industry today faces the urgent need of preparing for contract renegotiation or termination . . . of establishing inventory accountability in accordance with authorized production schedules . . . of avoiding potentially useless inventories of raw materials and work in process.

All these add new emphasis to the importance of setting up administrative control systems designed to produce *facts* from which management can operate intelligently.

This is the function of the Graph-A-Matic signalling method, an exclusive feature of the Kardex System of Visible Control. Graph-A-Matic makes recorded facts *chart themselves*. Whether they concern materials, men or machines, it presents them in a *graphic* form that enables executives to analyze and plan with speed and accuracy. And with operating savings as high as 50 per cent!

WE INVITE YOU to inspect the methods of administrative control now used by the management of 136 of the nation's foremost businesses. These are illustrated in the new 74-page brochure "Graph-A-Matic Management Control". Due to the nature of its contents and the many months of careful preparation entailed, we can offer this brochure only to responsible executives.

A wire, letter or phone call to our nearest Branch Office will bring "Graph-A-Matic Management Control" to your desk. One of our Systems and Methods Technicians whose work it represents will gladly discuss the application of these methods to your business.

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SYSTEMS DIVISION

REMINGTON RAND

BUFFALO 3, NEW YORK

MAKING a bigger days work Possible

Fatigue takes toll of production. When machinery is tiring to operate, the output curve slides toward the end of the day. Northwest engineers recognized this a long time ago and built Northwest cranes accordingly. One of Northwest's many exclusive features, the "feather-touch" clutch control takes the back breaking effort out of throwing the heavy drum clutches and makes operation smooth and easy.

The "feather-touch" control is simple. There are no delicate adjustments, no high pressure piping, nothing to leak, nothing to refill. The "feather-touch" control is unaffected by the weather. There can be no shut down due to the failure of controls and because the operator always retains the feel of the load, greater safety is combined with smoothness of operation.

The Northwest is a different type of crawler crane. Let's get acquainted. We'd like to tell you more about what a Northwest will do for you!

BUILT IN A RANGE OF 18 SIZES — 4½ TONS CAPACITY AND LARGER

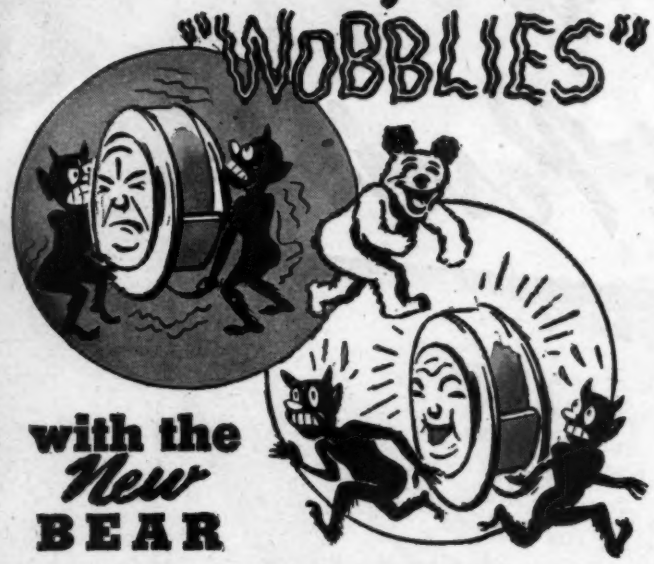
Let's get acquainted
INVESTIGATE THIS Different
CRAWLER CRANE

NORTHWEST ENGINEERING CO., 1811 Steger Bldg., 28 E. Jackson Blvd., Chicago 4, Ill.

NORTHWEST

The Crane that goes Anywhere!

Chase away the "WOBBLIES" with the New BEAR DY-NAMIC BALANCING



Chase away
Excessive Wear
Vibration
Noise
caused by
Couple-Force Action

No longer is it a difficult, tedious, costly process to chase these destructive "Wobblies" of Dy-Namic Unbalance out of Armatures, Flywheels, Fans, Crankshafts, Blowers, and other rotating parts.

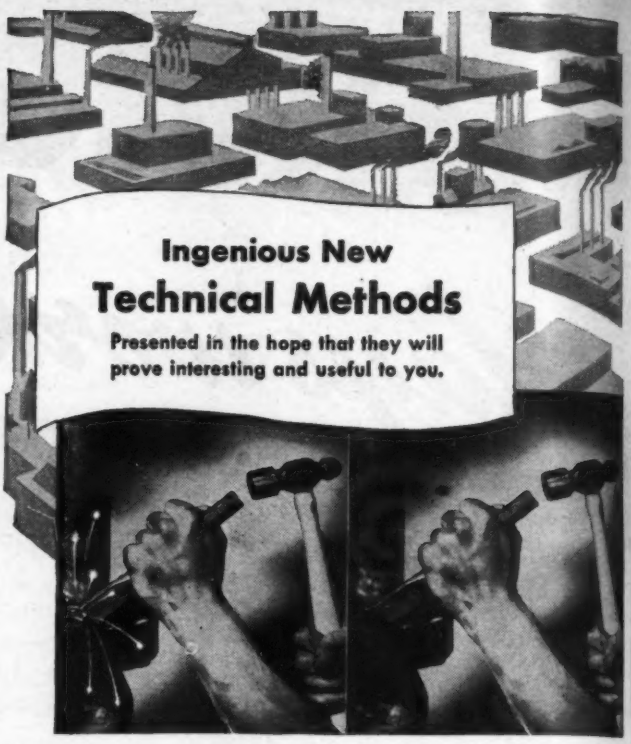
BEAR has introduced entirely New Dy-Namic Balancing machines—based on a totally different, but proven, principle—that makes Dy-Namic Balancing faster . . . lower cost . . . easier . . . requiring no skilled technicians.

Manufacturers, large and small, report that this new, Bear Dy-Namic Balancing has two great fields of usefulness:—

1. **On Products Manufactured**—Dy-Namic Balancing of rotating parts prevents premature wearing out; insures smoother, quieter operation and longer life.
2. **On Own Production Machinery**—Bear Dy-Namic Balancing lessens need for frequent adjustment and repairs; eliminates costly power waste.

WRITE FOR FREE DATA BOOK showing the many types, sizes and models of Bear Dy-Namic Balancing Machines available to those with war industry priorities. Address Bear Mfg. Co., Industrial Division, Dept. FMM, Rock Island, Illinois.

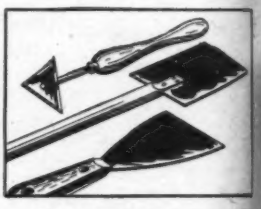
BEAR
COMBINATION
STATIC AND DY-NAMIC BALANCING MACHINES



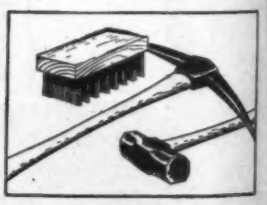
Ingenious New
Technical Methods
Presented in the hope that they will prove interesting and useful to you.

Beryllium Copper Bites Into Steel

It is an old saying that when a dog bites a man it is not news, but when a man bites a dog it is news. That being the case, it is certainly news when copper bites into steel. Copper is, of course, one of the softer metals but when 2 percent beryllium is added to copper, its characteristics are changed. The alloy is heat treatable which explains the remarkable strength and hardness. Hit a chisel made of Beryllium Copper with a hammer and it will bite into steel without dulling the edge. Tools made of Beryllium Copper are non-sparking and therefore are used in ordnance plants, oil refineries and other places where explosions may occur from sparks off steel tools. Tensile strength as high as 200,000 lbs. psi can be obtained with Beryllium Copper; hence, it is used for many applications where resistance to high loading and impact fatigue are important, such as airplane motor bushings. Most of the critical springs and diaphragms used in aviation, Navy and Signal Corps instruments are made of Beryllium Copper because of its reliability as a spring material.



Man has tried for ages to rediscover the art of hardening copper. Today this can be done by adding to copper a small percentage of beryllium.



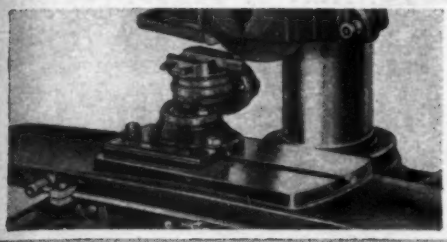
Not only does it produce an alloy harder than tempered steel, but one that does not produce sparks, an essential when working near highly combustible materials.

We hope this has proved interesting and useful to you just as Wrigley's Spearmint Gum is proving useful to millions of people working everywhere for victory.

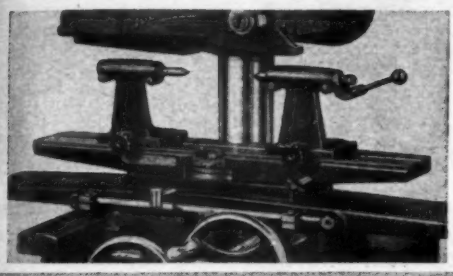
You can get complete information about these tools from the Beryllium Corporation, Reading, Pennsylvania.

X-65

1. As is . . it's a Surface Grinder



2. With the Univise . . it's a Chip-Breaker Grinder



3. With the Unihead . . it's a Tool & Cutter Grinder

DELTA
MILWAUKEE
Machine Tools

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3 accurate, dependable grinders

Any one of these combinations — by itself — is "a heck of a lot of machine for the money". But take all three together, and you have a saving that no shop, large or small, can afford to overlook.

As a surface grinder, it's a husky, big-capacity machine — over 6 ft. high, weighs close to 700 lbs., grinds surfaces up to 13½" long, 6" wide. Designed for ease and speed of operation—with convenient controls, wide graduations on micrometer for close settings, many other latest features for accuracy and dependability.

As a Chip-Breaker Grinder, it gives exceptionally accurate results in grinding the chip-breaker groove on carbide-tipped tools. Equipped with the Univise, which holds the tool at any conceivable angle, may be reset at *precisely* the same angles as original setting without bothersome and often inaccurate measurements.

As a Tool & Cutter Grinder, it makes tool sharpening simpler, easier, cheaper, and extremely accurate. With the Unihead attachment, almost any conceivable angle can be ground.

For a real find that gives creditable results for years, investigate this modern, safe, good-looking machine. Consult your Delta industrial distributor (Delta sells only through distributors) or write for new bulletins. M-8

Specifications

Wheels must have 1¼" hole.
Table surface 5¾ x 13".
Traverse feed, one graduation is .001"
Micrometer adjustment ⅜" range, each graduation is .0005".
Spindle speeds (with 60 cy. 1750 R.P.M. motor) 3200 and 4200 R.P.M.

No. 24-105 Surface Grinder.....$295.00
No. 24-205 Chip Breaker Grinder..... 343.50
No. 24-305 Tool & Cutter Grinder..... 370.00

Priority required, A-1-A or better, under restrictions of Limitations Order L-237.

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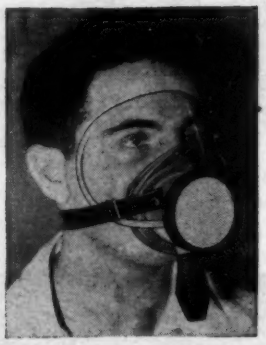
***Get the Safety Equipment you need—promptly—from* PULMOSAN!**



Accidents won't wait for safety equipment that is "on order"! Rely upon Pulmosan to keep you supplied with adequate, dependable safety equipment for every hazardous operation in your plant.

Pulmosan facilities and service have been greatly expanded to keep step with increased demands for safety equipment. Headquarters for "everything for industrial safety", Pulmosan has hundreds of safety items in stock for prompt shipment. Our engineering and development department is at your service to advise on any safety problem or to make equipment to special requirements. Let us know your requirements.

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Acid and Chemical handling, Bulletin Boards, Face and Eyeshields, First Aid, Foot Guards, Gas Masks, Goggles, Helmets, Hoods, Protective Clothing, Welding, etc., etc.

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The New, Highly Efficient Aid *for the* Prevention of Absenteeism

HANOVIA'S *Ultra-violet* "LIGHTHOUSE"

Hanovia—the world's largest manufacturer of Ultra-Violet equipment offers Factory Management the new "Lighthouse" to help workers keep physically fit.

It is universally recognized that "sunshine" is essential to health and that the most vital elements in it are the "actinic ultra-violet rays" — such as produced by Hanovia's Lighthouse.

This Lighthouse has been created for the ultra-violet irraditions of groups of persons. It has been designed to stand upon the floor in the center of an area about twelve feet in diameter where employees can walk or stand about the lamp at an average distance of five feet. Fifteen persons can be accommodated at one time at five feet distance—the ultra-violet application involving only a few minutes.

The Lighthouse is sturdily built, easy and economical to install, maintain and operate.

Experience has shown, where Hanovia Ultra-violet Lamps are installed absenteeisms due to colds and other simple ailments are reduced considerably.

Here is an official medical record showing how absences caused by common colds were reduced by over 40%.

Dr. J. B. Sherman, medical supervisor at Cadbury Bros. works at Bournville, England, made elaborate and careful tests on 1635 employees with various methods of preventing colds.

While the average absence due to colds amounted to 106 days per 100 workers, in the group given periodic sun baths under Hanovia Ultra-violet lamps, this record was lowered to 66 days per 100 employees.

Dr. Sherman concludes:

"It was found that the only method of real value was ultra-violet irradiation, which reduced both the severity and the number of colds in patients treated."

Hanovia engineers will gladly cooperate with any plant management and furnish estimates, blueprints and complete information on the installation of Hanovia's "Lighthouse" for group irradiation.

Send for Free booklet, "Fitness in Industry".

Address—Industrial Division Dept. F-3

HANOVIA Chemical & Mfg. Co.

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World's largest manufacturers of Ultra-violet Equipment for the Medical Profession and Industry.

5222 CHANCES TO MISS A KAGA

Talk about "living costs"? Think of the cost of killing Kaga carriers at historic Midway.

Fifteen torpedo bombers . . . against thirty fighter planes and the anti-aircraft fire of five ships . . . through lead and deadly water spouts . . . went in to strike that Kaga down!

One pilot lived. His plane, the fifteenth—before it fell—let loose the last white-nosed torpedo at the flank of death . . . the one that found its mark!

The cost . . . fifteen of fifteen planes and twenty-nine of thirty men. Such casualties have not occurred again—for faster, more maneuverable planes now do torpedo work—but that one gallant action may have saved America.

Fifteen tries, with sudden death the penalty for failing and succeeding both. How tragic if *one defective part among that last torpedo's 5222* had made the venture fail.

Our part is small, we know.

Yet here at R B & W, making millions of bolts and nuts each day to fasten parts our armed forces, our war industries use, we also know that *every part, even the smallest, counts.*

We say, "If our individual skills and the full use of our special manufacturing processes can prevent a single Allied fighter from dying in vain . . . if the extra care we are giving our work can bring victory a day or hour closer . . . then we are repaid many times over." Russell, Burdsall & Ward Bolt and Nut Company, Port Chester, N. Y.

* * * *

If you, too, are making "bits and parts" for war equipment which your workers never see in action, this story of gallantry at Midway is available as a *poster* for your plant, free of advertising—and, of course, free of charge.

RB&W *Making strong the things that make America strong*

RUSSELL, BURDSALL & WARD BOLT AND NUT COMPANY

PRELUDE TO BATTLE

SIGNODE

● Thousands of miles and weeks of travel from the production lines, supplies *must be delivered safely* before a battle can begin. That's why Army and Navy contracts frequently specify packing methods and materials—including steel strapping—for the *extra margin of shipping safety.*

No matter what your product or your shipping problem may be, Signode package and carloading engineers stand qualified to give *you* practical shipping suggestions, as they have for so many others.

Remember, a nearby Signode representative is ready to help assure safe delivery of *your* vital war materials.

Bowdoors of an LST swing wide to deliver supplies for Rendova Island in the Central Solomons. The Rendova action preceded the capture of nearby Munda.

SIGNODE

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Signode Steel Strapping Meets All Federal Strapping Specifications

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Quickly pays for itself ..

A New Low-Cost DURO Quality SHAPER, CARVER, ROUTER

This new three-in-one Router, Carver and Shaper has proven a boom to metal-working shops. It is ideal for routing non-ferrous metals and many other operations. Can be set up for time-saving duplicate routing and veining.

Combines high speed (20,000 R.P.M.) power (1200 watts at the spindle) and solid, heavy construction that gives smooth, vibrationless cutting. Is extremely flexible—can be transformed quickly into a Shaper. Standard equipment handles ¼", 5/16" and ⅜" bits for routing—5/16" and ½" shaper cutters. Has many special features including; Specially designed G. E. Universal Motors, New Departure Precision ball bearings, precision machining throughout; Table can be instantly adjusted to any height without holding foot pedal. Chuck is part of spindle and holds adaptor and cutter extremely close to work thus preventing whip. Many other exclusive features. Unusually low-priced.

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DURO METAL PRODUCTS COMPANY
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Gentlemen: Please send me FREE copy of latest DURO Catalog giving full specifications on new DURO Shaper-Carver-Router and other DURO Machine Tools.

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Giving full specifications and prices on the DURO Shaper—Carver—Router and other DURO Quality Machines including Drill Presses, Circular Saws, Band Saws, Flexible Shafts, Lathes, Sanders and Electric Drills.

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MACHINE TOOL DIVISION

ALSO MAKERS OF DURO HAND TOOLS

One way you can help cure the wire wheel shortage

Turn every wire wheel Every Day!

Increase brushing tool life up to 200%, increase production, improve work, help operators.

THIS is what happens when a wire wheel is run in the same direction constantly. The individual wire ends become dull, reducing the cutting action of the brush. The operator in seeking to maintain the cutting action applies the work to the brush with greater force. This starts the wire bending. The operator pushes harder—the wires heat, fatigue (crystallize) and begin to break off.

But if you turn every wire wheel every day, the end of the wire will wear evenly—each wire always has a straight edge with full cutting value constantly maintained. That means you get out more and better work, *and far more pieces per brush.* And since the operator doesn't have to increase his push, the work is easier on him and he does a better job.

Brushing wheels are like any other tool—there is a right and wrong way to use them on each job. The Osborn Brushing Specialist can work with you to make sure the *right* way in your plant gives you longer brush life and better work. This service is free, regardless of the make of brushing tools you use. It has doubled brush life in many plants. Write *The Osborn Manufacturing Company, 5401 Hamilton Avenue, Cleveland, Ohio.*

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WORLD'S LARGEST MANUFACTURER OF BRUSHES FOR INDUSTRY

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—and MORE PAY for men who know their work!

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6 Volumes, 2368 pages, 2516 illustrations, many charts and tables

THESE books answer your questions on methods and machines—tell what you need to know about the operation of machines of all types and sizes for the whole range of metal cutting, forming, and finishing operations — show by text, diagram, and illustration the essential points of setting up work, adjusting machines, selecting feeds and speeds, determining pressures, handling materials, devising short-cuts, etc.

What the Library gives you: description of all important varieties of machines, both manual and automatic; data on speeds and feeds, new cutting alloys and materials; practical information on grinding machines and abrasive wheels; exact, descriptive data on all aspects of gear-cutting practice;—the gist of more experience than any one man could amass in a lifetime of work.

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● First, SYNCHRO-START provides AUTOMATIC starting and stopping for single or multiple engine installations. An increase in power demand or failure of any engine will automatically start additional engines; decrease in power demand will likewise automatically cut out units not needed. In case an engine fails to start after a predetermined cranking period or, in the event of overheating, low oil pressure or other abnormal conditions, it protects that engine by cutting it out and flashing a signal to any point desired. It eliminates the human element; never forgets; is never absent.

● Consult any dependable engine manufacturer as to how a SYNCHRO-START equipped gas, gasoline or diesel engine can provide a more economical, more dependable source of instantaneous, automatic power or write direct to us.

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CUTTING FLUIDS DESERVE YOUR SERIOUS ATTENTION

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Be honest . . . in your plant are cutting fluid problems given the attention they deserve? Are your performance records accurate? Are you aware of what better cutting fluids can do for the job? Or is your attention centered on other fields until real trouble develops which might be traceable to improper use of cutting fluids? Hundreds of metal-working plants are getting the most out of their cutting fluids by working closely with the Stuart service engineer. They know that there is no universal cutting fluid, no magic compound—but when a Stuart product is put on the job they are sure they have every cutting fluid advantage that broad engineering experience and "know how" can give them.

To be sure you have all the advantages, work with the Stuart service engineer, representing a company which has specialized in metal-working lubrication since 1865.

We invite you to write for our new free booklet, "The 577th Oil," which contains twenty-two case histories, typical examples of how Stuart engineering is solving production problems, (like your own), as well as other valuable metal-working data. State your name, company and title.

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1. Do not drop.
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3. Replace plugs carefully when drum is empty.
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Model AR

Today more plants than ever are using Redington Counters as "watchdogs of production." Installed on conveyor lines, screw machines, punch presses and other equipment, these counters tell at a glance whether output is lagging . . . they help know costs . . . prevent shop squabbles on production figures. Models for many types of machines. Write for details.

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Something was definitely wrong at Warehouse E. It almost looked like sabotage. The maintenance department began to dread wet weather, because some way, somehow, water was finding its way into the building, damaging valuable war goods . . .

Naturally, the first impulse was to blame the roof, yet a careful inspection proved the roof to be sound. Finally a patient vigil in the rain revealed the source of the trouble. More than fifty feet away from the spot where the water dripped through the rafters was a skylight with poor caulking. Until this was discovered, tempers were frayed and money and energies were wasted.

Roof failure is frequently caused by just such obscure, unsuspected weaknesses. Sometimes it results from defective masonry, damaged flashings, clogged drains . . .

Most of these danger points are well known to experienced roofers. That's why it's so important to call in your local Barrett Approved Roofer. He and his trained staff can seek out hidden weaknesses, even before trouble develops. He does an expert job—quickly and efficiently. Leave it to him; there's no need to take your own men away from vital production work. Of course, if you prefer, write us direct.

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***BARRETT MATERIALS AVAILABLE FOR WARTIME ROOFING NEEDS. If you're building a new plant or reconditioning warehouses or other buildings, use dependable roofing materials and methods. Barrett Pitch and Felt are non-critical, and are readily available through your local Barrett Approved Roofer. Consult with him or with us on any roofing or waterproofing problems.**

Barrett Specification* Roofs

*Trade-mark Reg. U. S. Pat. Off.

"Me, Too, Brothers!

—what this place needs is some good old-fashioned HOUSECLEANING —and some action by the Demolition Squad—

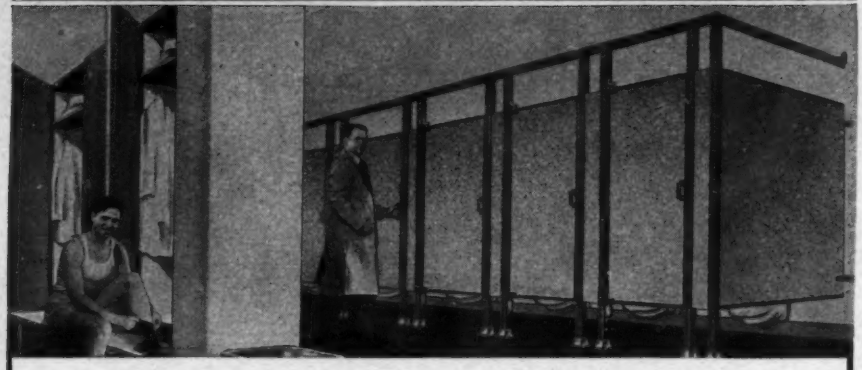
YES, I MEAN TOILETS AND WASHROOMS

and I've Quit Whispering."

Sanymetal **Asbestos Board Toilet Compartments**

complete with door hardware and partition fittings

NOW AVAILABLE—READY TO INSTALL



Improved TOILET ROOM ENVIRONMENT MEANS BETTER WORK

A little housecleaning may go a long way — and if you find any of your toilet compartment units needing replacement, it's easy and economical with the complete Sanymetal Toilet Compartments. You can't blame workers for being disgruntled or even downright sore when they have to put up with inadequate toilet facilities — to be uncomfortable means to be unhealthy, unhappy, unalert, and unsafe. It also increases absenteeism. Sanymetal Asbestos Board Toilet Compartments, made in three types for wartime installation, provide the utmost convenience, privacy and sanitation.

SAVE TIME AND MONEY: no need to design or attempt to build home-made toilet facilities. Sanymetal Compartments are economically designed and built by specialists, made with the best materials available and furnished complete with door hardware and partition fittings.

CONVENIENCE AND SANITATION are embodied in Sanymetal Asbestos Board Toilet Compartments in a degree unappreciated, unapproached by those lacking Sanymetal's 28 years of specialized experience in this line.

DURABLE AND RIGID installation provided by laminated cement-asbestos boards which affords a strong structure resistant to fire, wear and moisture — free from dirt-collecting pockets and ledges — easy to keep clean.

ONE ORDER, ONE PRIORITY covers everything you need for complete installation, even complete door hardware and partition fittings. For quick action, call local Sanymetal Representative, listed in most phone books under "Partitions" — or send the coupon for Bulletin giving complete details.

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Please rush by return mail your new Bulletin on Sanymetal Asbestos Board Toilet Compartments.

Name.....*Position*.....

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LUNCH MEETS THEM *halfway* in This Busy Plant!

When workers STAY IN to lunch, they're back on the job sooner, feeling more refreshed, better able to *do more* the rest of the day. Since food rationing began, *fewer workers bring lunch from home . . .* so a plant cafeteria is more vital than ever to employee morale and production speed.

Pick Engineers have planned and built cafeterias for War Plants of every size and type. They know the problems . . . they can help you find the answers, whatever your budget may be. Send for our illustrated booklet No. PC 8.

PIX PORTABLE FOOD-BAR Designed to save steps, save time, save precious floor space. Keeps hot dishes, soups and coffee *piping hot* . . . serves sandwiches, drinks, pastry and candy. 4 sizes. Send for our booklet CW8.

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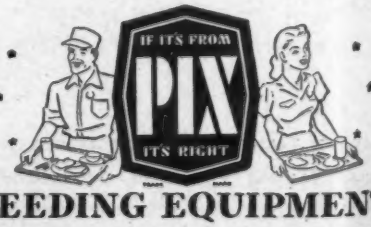
America's Leading Food Service Equipment House



FEEDING EQUIPMENT

★ *For War Industries* ★

"The Inspector and I Get Along OK"

. . . since we changed to AMERICAN PHILLIPS SCREWS that drive straight and set up tight . . . with no burred heads or scarred work

WORLD'S EASIEST, FASTEST, SAFEST METHOD OF PRODUCTION SCREW DRIVING

Every fastening made with American Phillips Screws is a clean, strong fastening . . . *the first time it's made.* No crooked screws to be re-driven. No burred and broken screw-heads to be backed out and replaced. No holes to be re-tapped.

Neither are there any gouges on the work-surface, to cause rejection of finished material. For the Phillips Driver engages the American Phillips Recessed Screw Head in a firm contact, making one single, self-aligned driving unit *that stays put until the screw is turned up tight and flush.* There's no wobbling at the start, no physical strain in the driving operation. So women and inexperienced men can keep up the work-pace, without difficulty or undue fatigue. And output increases as time-per-fastening is cut . . . as much as 50%.

In addition, there are special advantages to American's brand of Phillips Screws: *Full Value,* assured by automatic weigh-count. *Piece Inspection* of head, thread, and point. *Delivery Service,* maintained by high-speed production. *Engineering Service,* at *your* service on any special fastening problem. That's why more and more buyers of screws specify: "American brand".

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PROVIDENCE, RHODE ISLAND
Chicago: 589 E. Illinois Street
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Prevent accidents with this ASBESTOS Oil and Grease Absorbent

Every time an American workman is injured as the result of slipping and falling on an oil or grease soaked floor, Hitler and Hirohito have real cause to celebrate. Yet these frequent accidents—so costly in money, time, and manpower—need not happen. You can help prevent them with CAREY ASBESTO-SORB.

A free trial will convince you! Write us today for full information and a sample of ASBESTO-SORB for making your own test. Address Dept. 31.

Carey ASBESTO-SORB

ASBESTO-SORB is an improved, inexpensive, super-efficient compound that absorbs oil and grease — literally "eats it up." ASBESTO-SORB provides a non-skid, non-slip floor surface that's safe, greatly lessening accident danger. ASBESTO-SORB is used dry; nothing to add. It's harmless to floors, hands, shoes, clothing. Economical—can be used over and over again. Quickly spread by hand . . . easily swept up.

FIRE SAFE . . . another quality highly important to you and the war effort. ASBESTO-SORB is rated "Class I, Non-Combustible" by Underwriters Laboratories, Inc.

is excellent for soaking up acids around pickling vats, storage battery spillage, cleaning solutions, etc.

When spread as a mat, ASBESTO-SORB serves as a cushion underfoot. It doesn't "ball up" and is not tracked around the plant.

PROMPT SHIPMENTS IN 50-LB. BAGS FROM 45 BRANCH WAREHOUSES.

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Help Lick the MANPOWER SHORTAGE

You can release men for other war work by using Fairbanks Lift-Jack Trucks.

Simply put a skid platform at every production line so products can be loaded as finished, and rolled away when filled. That saves piling up materials at points of origin and later loading them onto trucks — saves one or more handling.

Ask for booklet J-1.

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Fairbanks PLATFORM, HAND and BOX TRUCKS

Prompt Shipment from Stock—Essential Tools Today

because they save hours of time, prevent costly breakage and long shut downs.

STEELGRIP Standard Rigid Arm Gear and Wheel Pullers are of improved design. Will not slip from work. Arms are forged and heat-treated. 2-arm, 3-arm and special models. 12 types and sizes.

CHAINGRIP Universal Pullers pull wheels, solid gears, pinions, etc., even at considerable distance from end of shaft. Proof-tested chains have both chain hooks and special pulley hooks. 3-ton and 12-ton capacities.

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"HOW'D IT HAPPEN DADDY?"
TO PROMOTE YOUR EYESIGHT CONSERVATION PROGRAM
You'd hate to confess "CARELESSNESS"
WEAR YOUR BAUSCH & LOMB Safety Goggles ON THE JOB

"Selling" Eyesight Protection To Employees

The high degree of impact resistance in Bausch & Lomb safety lenses, and the rugged quality of the frames that hold them give not a single ounce of protection for workers' eyes *unless these safety goggles are being worn.*

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The compelling story expressed in this poster will help to strengthen your eyesight safety program. The poster, one of a series produced by Bausch & Lomb for users of Bausch & Lomb safety lenses and safety goggles, is available for factory bulletin boards. (Poster size is 13¾" x 21¾".)

Send your request, stating number of posters you require to Bausch & Lomb Optical Co., 741 St. Paul St.

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How to make time studies

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Here at last is a course in time study for those who do not have extended technical, mathematical, or industrial training. It starts at the very beginning and covers completely both the methods of time study and the background of machines and operations of industry the time study man must understand, in a practical, home-study treatment. The author of the book says, "Anyone who can rate 90% in answering these questions (appearing at the end of each chapter) would be able to take and hold a time study position in any industry."

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By William H. Schutt

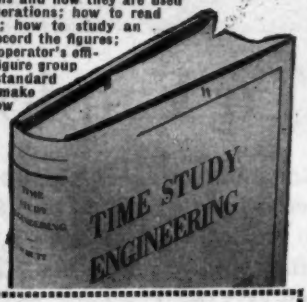
President, Detroit Time Study School, Inc.

430 pages, 6 x 9, 124 illustrations, $5.00

The book shows the whys and wherefores of time study work, reviews the arithmetic needed, tells step by step how to carry out a time study, and gives a wealth of information on the machines and processes of industry, what the time study man should know about their construction and operation, and the special factors of taking time studies on each. Twenty-eight specimen studies on specific machines and operations are shown and fully discussed in the text.

- **gives 26 time-study charts; each from an actual observation in industry**
- **describes machines and operations and their time-study factors**
- **emphasizes factors of economical production and fair standards for the worker**

Covers: Fundamentals of time study, requirements of work, equipment and how it is used, etc.; the basic motions and how they are used in analyzing operations; how to read the stop watch; how to study an operation and record the figures; how to rate the operator's efficiency; how to figure group bonus and standard hours; how to make process or flow charts, etc.



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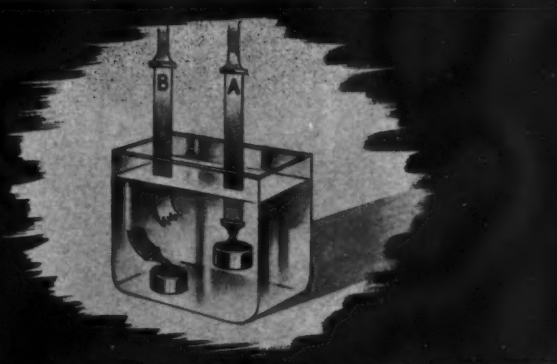

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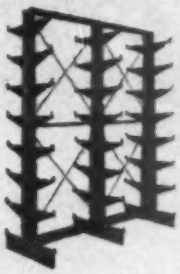

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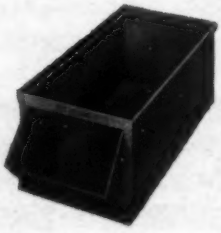

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Safe, convenient mobile storage for workers' clothing. Takes up less floor space per person than the area covered by a man's hat! Especially suited to war industries where efficient and compact, low cost clothes storage is a prime requirement.
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Strong hardwood shelving *adjustable* every 3" vertically and horizontally by hand. No tools necessary. Complete assembly requires one tool—a screw driver! Quickly set up by inexperienced help. Easy to take down and re-erect in a new location. Open and closed types. WRITE FOR PRICES.

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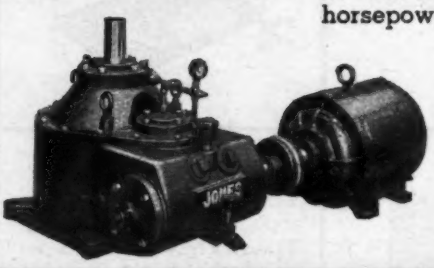
For driving agitators, mixers and similar equipment—

JONES WORM-HELICAL SPEED REDUCERS

HERE is a line of machines that fills a long felt need for double reduction units of the fully enclosed type to be used for agitators, mixers, etc. requiring a vertical shaft drive.

Many of these Jones units have established excellent performance records in a wide variety of service. As a result of that experience a complete standard line has been developed covering 15 standard ratios ranging from 40 to 1 to 250 to 1 for all common motor speeds and a wide range of horsepower ratings.

• This Jones Worm-Helical Speed Reducer on a lacquer agitator is typical of the wide range of services for which these drives can be used such as ore roasters, pulp tank mixers, furnaces, bending rolls and similar applications.



The new Jones Bulletin No. 75 covers complete details on these new Worm-Helical Speed Reducers, with rating tables, dimension diagrams, torque charts and other application information. We shall be pleased to send you a copy.

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CUT AND MOLDED TOOTH GEARS • V-BELT SHEAVES • ANTI-FRICTION
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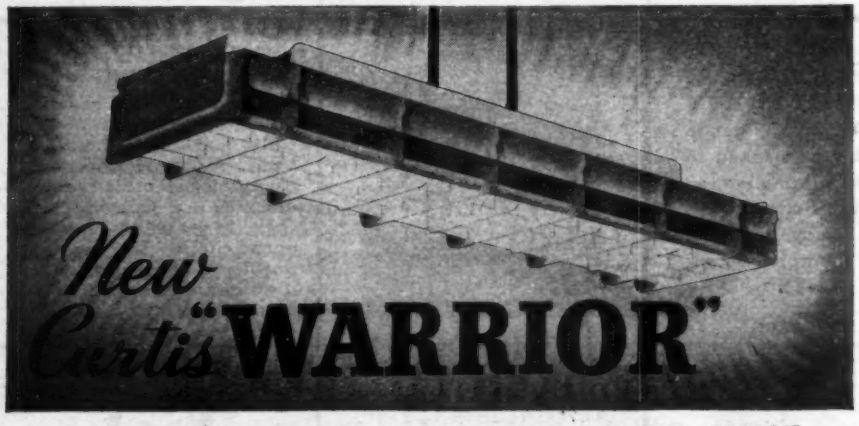


New Curtis "WARRIOR"

A NON-METALLIC FLUORESCENT UNIT

for Offices and Drafting Rooms

Here's a unit with typical Curtis character . . . a touch of modern functional design . . . Easy to install . . . either single pendant or single ceiling mounted . . . perfect for continuous lines . . . High in efficiency and low in maintenance expense . . . Metal channel of the unit well within government limitations . . . louver and reflector made of less critical materials . . . finished in Curtis FLURACITE.

Let the Curtis "Warrior" help you sell your next lighting job.

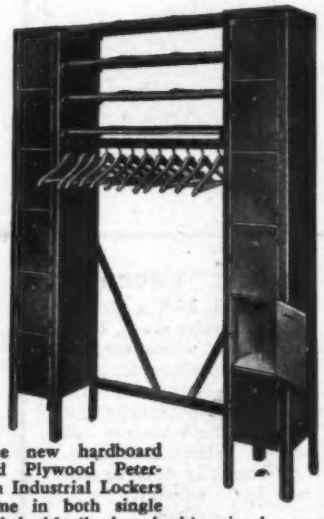
SPECIFICATIONS MAINTENANCE: The louver assembly consists of bottom, sides and ends assembled in one unit. Releasing two spring catches on either side of the fixture permits it to hinge from the remaining two spring catches for cleaning and lamp replacement. To remove completely release all four catches. WATTAGE: For four 40-watt fluorescent lamps.

We are proud to have been awarded the Maritime "M" for outstanding achievement in production of war material.

CURTIS *Lighting*, INC.
6135 WEST 65TH STREET, CHICAGO 38, ILLINOIS

New "Wood" Locker Unit

Accommodates 12 in 5 ft.



The new hardboard and Plywood Peterson Industrial Lockers come in both single and double (back to back) units that accommodate either 12 or 24 persons in every 5 running feet. Double locker room capacity and save valuable floor space for productive use. Provide each employee with a spaced coat hanger, an individual ventilated hat shelf and a 12 in. x 12 in., lock box for lunch, micrometers, drawing instruments or personal effects.

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VOGEL-PETERSON CO. "The Checkroom People"
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THE Brewster Company, Shreveport, Louisiana, had an unusual production problem. Specifications on a large order for drilling equipment called for one of the products—cable sheaves—to be flame hardened in the cable grooves.

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Standard methods were not practicable in this case. This is why the Brewster Company called in Air Reduction engineering specialists to help work out a special production set-up. The result was an unusual but simple fixture designed and built by the Air Reduction men. This effective production jig enabled the manufacturer to meet his specifications and schedules, and at the same time save considerable expense.

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If you have a problem involving some use of the oxyacetylene flame and electric arc, Air Reduction's engineering and research personnel will be glad to help you. For further information write your nearest Air Reduction office.

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an unusual book that brings you
Self development *without* self delusion

HOW TO—give your ego a chance—what it is, what it needs for uninhibited action, how to overcome the fears of all degrees that affect it

—how to lay out a workable life plan—with objectives that will satisfy *you*—and definitely attainable because you yourself have made it so

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Here is a book that promises you much good, in a fuller, more successful and satisfying life . . . and shows you how to get it without undertaking complicated psychological analysis or rigid regimentation of your affairs.

In a sensible, bunk-less treatment, it explains simple ideas and methods for achieving success and happiness *in terms of a satisfactory way of life within your opportunities and capabilities.* It will help you set a reasonable and worthwhile goal—to reach that goal—and to enjoy life in the process.

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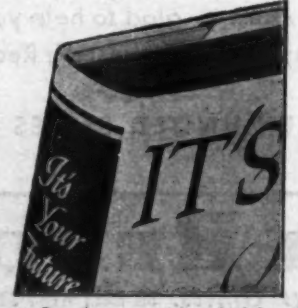
This is not a book to study, but one to read through easily, then to re-read, in whole and in part. Martin Panzer writes smoothly and with much humor, and with focus on everyday people, situations, and circumstances in his illustrations and anecdotes. You'll find yourself absorbing his ideas and pointers, understanding and applying his methods, even as you enjoy this readable book.



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affects the Quality and Quantity of Work

...ISOLATE IT WITH FELTERS UNISORB

Because vibration is often considered an inescapable part of a machine's operation, too often nothing is done to cut down the bad effects of this vibration. These bad effects are: a poorer quality of work, reduced output, increased wear and repair of machines and floors, decreased operator efficiency.

But fortunately, as many companies know, *machine vibration can be isolated and dampened with Felters Unisorb—in a short time and at small cost.* And the savings from using Unisorb for this purpose are big . . . and quick.

Send for the Felters Booklet "Unisorb in the Industrial Plant." It contains charts, tables and greater details of the advantages of using Unisorb.

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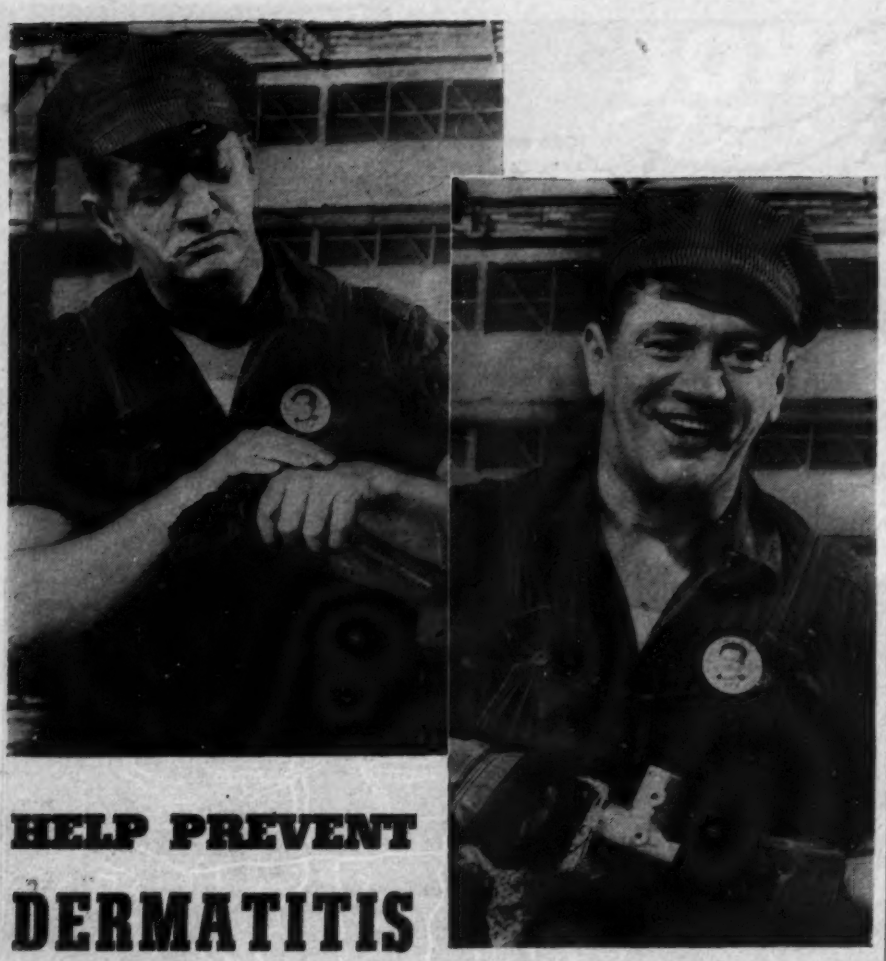

HELP PREVENT DERMATITIS ... AND SPEED PRODUCTION

Occupational skin diseases are a major cause of time lost from work in industry.* The millions of men and women whose skin must necessarily come in contact with chemicals and other irritants in the course of their work are learning that certain precautions are necessary.

West supplies industry with these products and many others designed to fill virtually every demand of modern industry for healthful cleanliness.

All authorities agree on the importance of personal cleanliness and some authorities go so far as to state that 90% of all occupational skin diseases could be prevented by proper personal cleansing methods. Tested in the fire of war-time necessity, Lan-O-Kleen has proven to be the most satisfactory hand cleaner ever used in many of our greatest war plants.

The story of Lan-O-Kleen therefore should be of paramount interest to industrial physicians, safety engineers and plant managers everywhere.

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Built For Heavy Production Service

BALDOR GRINDER No. 612 has Capacitor Type 1/3 HP Motor guaranteed 2 yrs. against burn-out. 3440 r.p.m. 110 volt, 60 cy., single phase. 6" x ¾" wheels; enclosed guards; adjustable eye shields and tool rests. Net weight, 46 lbs. **$33.50**

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*SPECIAL MOTORS DESIGNED TO FIT THE APPLICATION

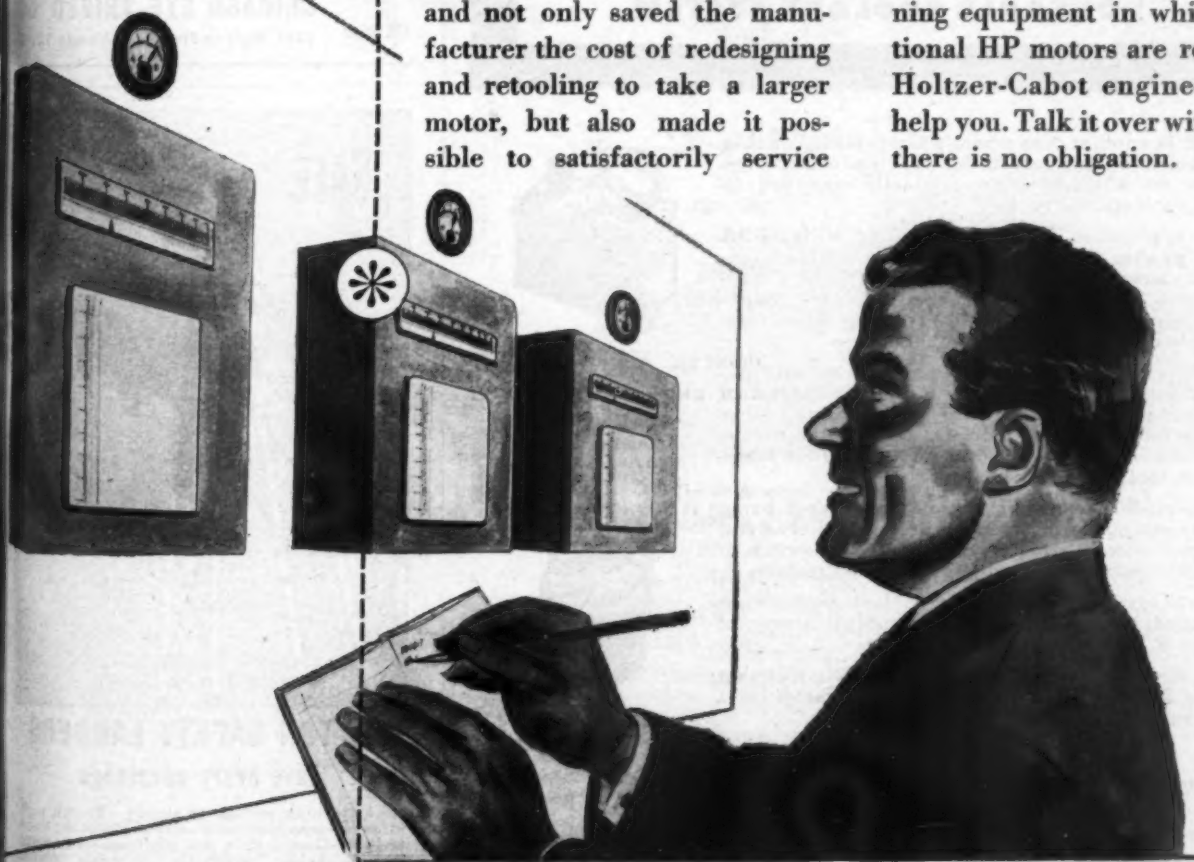
SAVE SPACE AND WEIGHT..WITH NO LOSS OF POWER

The requirements of a manufacturer of instruments called for a motor that had unfailing constant speed and increased power, yet would fit in a space originally designed for a standard clock motor.

A specially designed Holtzer-Cabot synchronous motor filled the performance requirements and not only saved the manufacturer the cost of redesigning and retooling to take a larger motor, but also made it possible to satisfactorily service instruments in customers' plants that had the old type of motor.

The specialized business of Holtzer-Cabot is the designing and building of special fractional HP motors, and our energies, for more than 68 years, have been concentrated in this field.

If you are building or planning equipment in which fractional HP motors are required, Holtzer-Cabot engineers can help you. Talk it over with them, there is no obligation.



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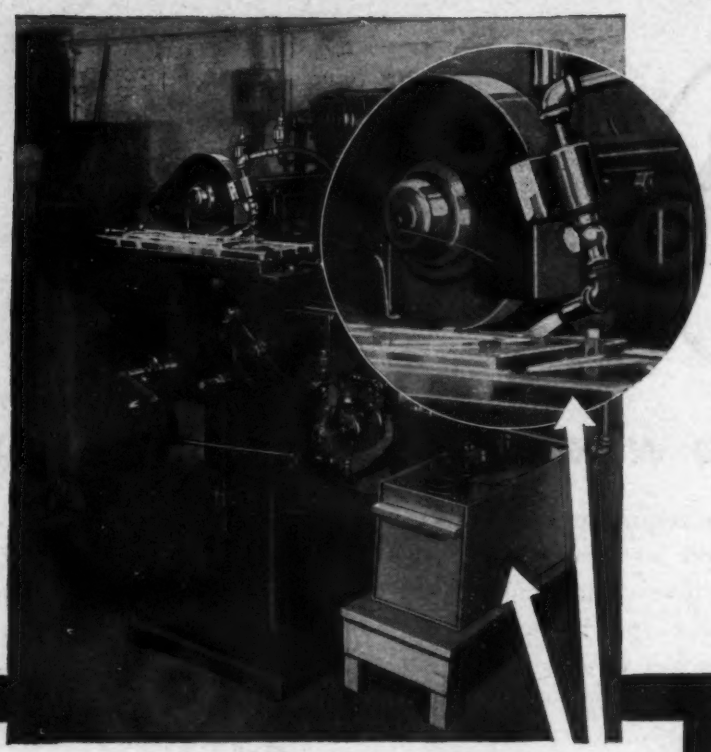
Designers and Builders of Special Fractional HP Motors and Electrical Apparatus

125 AMORY ST., BOSTON, MASS. CHICAGO, ILL., NEW YORK, N, Y., PHILADELPHIA, PA.



Another Grinding Problem *Solved* by a GRAY-MILLS PORTABLE COOLANT SYSTEM

HERE is another case where a Gray-Mills Portable Coolant System solved the problem of applying coolants on a machine not originally equipped to handle coolants.

In the application, illustrated, a Gray-Mills G-3A System applies the coolant making it possible to adhere to extremely close tolerances in grinding magnetic steel. Heat dissipation keeps steel from hardening, thus speeds up output and prolongs wheel life. Baffle plates settle out chips and abrasives.

Gray-Mills Portable Coolant Systems are quickly and easily set up for operation by your own maintenance man. They can be used with any machine, small, large or special, to step-up production, save tools, decrease down time. On most applications they pay for themselves in tool savings alone.

All late model Gray-Mills Coolant (gear type) pump units are equipped with automatic pressure relief valves, to protect motor against overload; electric switch in cord; and control valve at the point of application.

There are systems to meet every coolant requirement . . . including a high volume centrifugal pump of 3000 G. P. H. capacity.

Investigate the advantages of Gray-Mills Portable Coolant Systems. Ask your mill supply dealer for a demonstration. Write us for complete details.

4 Heavy Duty "A" Series Models—with large capacity coolant tanks incorporating forced settling baffles and screen strainers. Capacities from 60 to 180 G.P.H., Pressures from 15 to 50 lbs. P.S.I.

3 Model "G" Series (Round Tanks). Small compact units—with capacities from 60 to 130 G. P. H., Pressures from 10 to 20 lbs. P. S. I.

GRAY-MILLS CO.
218 W. Ontario Street ★ Chicago 10, Illinois

GRAY-MILLS

Complete Portable COOLANT SYSTEMS

Use GRAY-MILLS COOLANTS . . . 5 types for most requirements—10 and 55 gal. containers—immediate delivery from your distributor or our plant.

WIDE VISION GOGGLES

★ Visible evidence of increased production and superior craftsmanship is sure to follow when workers are provided with proper eye-protection.

An Example: Cesco's No. 222 Wide-Vision Goggles establish a broad view of any operation. Ventilated eye cups reduce fogging. Cool. Comfortable. Plastic lenses resist impacts. Order now for prompt attention to deliveries.

Write for Circular No. 222

CESCO **CHICAGO EYE SHIELD CO.**
2331 Warren Blvd. Chicago 12, Ill.

DAYTON SAFETY LADDERS have every advantage

No extra man needed to steady—Roomy platform for men and tools—Great strength, lightweight—Guard rails on platform—Automatic locking—Folds compactly—Airplane spruce used throughout—Steel braces—Safety shoes. Available in sizes 3' to 16' in height—Elevating platform adds height to the Dayton Safety Ladder. *Write today for Free Catalog*—Prices.

DAYTON SAFETY LADDER
122 W 3rd St

with the help of FACTS-IN-FIGURES

When the air is thick with metal wings on the airways to and from the nation's capital, it's a touchy business keeping pilots out of each other's way . . . bringing them in, clearing them out. So the Civil Aeronautics Administration is turning from the slow hand-posting of flight data and hand-copying of reports to fast automatic flight-control and progress boards.

These boards, linked by telegraph networks to key points along the 1500 miles of airways in each traffic-control area, will post the data for all flights in the area . . . using numerical codes to show the controller such items as flight identification, direction, estimated and actual time, proposed and actual altitude, clearance instructions. With the help of these up-to-the-minute *facts in figures*, more planes can be controlled with greater safety, speed, and efficiency.

In the Washington Airway Traffic Control Center, the world's first electrical flight progress board, developed on the principle of the automatic stock quotation system, points the way for this modernization. In it you will find thousands of Veeder-Root Counting Devices making up the columns of single-digit indicators showing the flight data.

So add a postscript to the time-honored statement that "Veeder-Root Devices Count Everything on Earth". Now they will also count every plane *over* the earth. And write it down, too, that if your product or plant counts in the war effort, chances are that Veeder-Root can find a way *to make it count for more than ever before*. Write.

VEEDER-ROOT INC. HARTFORD, CONNECTICUT

PROTECTION

AT YOUR FINGERTIPS—

against industrial skin irritations

M·S·A FEND

PROTECTIVE CREAMS AND LOTIONS

FEND products provide protection against skin irritations for today's workers, easily and quickly! Rubbed into the skin, FEND disappears—leaving a protective barrier against irritants. When work is finished, FEND is removed by simple washing with soap and warm water. The complete FEND line is detailed, with Application Chart, in a descriptive Brochure. Write for your free copy.

MINE SAFETY APPLIANCES COMPANY

Braddock, Thomas and Meade Streets, Pittsburgh, Pa.

M·S·A PRODUCTS INCLUDE: BREATHING APPARATUS . . . INHALATORS . . . APPROVED DUST RESPIRATORS . . . MASKS OF ALL TYPES . . . GAS INDICATORS . . . GAS DETECTORS . . . SAFETY GOGGLES . . . PROTECTIVE HATS AND CAPS . . . EDISON ELECTRIC CAP LAMPS . . . SAFETY BELTS . . . SAFETY CLOTHING . . . DUST INSTRUMENTS . . . FIRST AID EQUIPMENT . . . PROTECTIVE HAND CREAMS

JONES CONTINUOUS INDICATING TACHOMETERS

Speed Production

Reduce your overhead by maintaining efficient speeds. Jones Tachometers provide constant check on R.P.M., miles, feet, yards, gallons per minute, etc., total run as well as speed. Innumerable industrial applications — both fixed and portable types available.

- Centrifugal type (no magnets) with uniform scale over entire dial
- Lightweight, durable; ball-bearing mechanism requires no servicing
- Low initial cost
- Rigid inspection and calibration

Our engineering staff will convert any model to meet your special requirements. Write for catalog.

JONES MOTROLA SALES COMPANY

431 FAIRFIELD AVE. STAMFORD, CONN.

SWEET'S FILES

for 1944 carry the story of

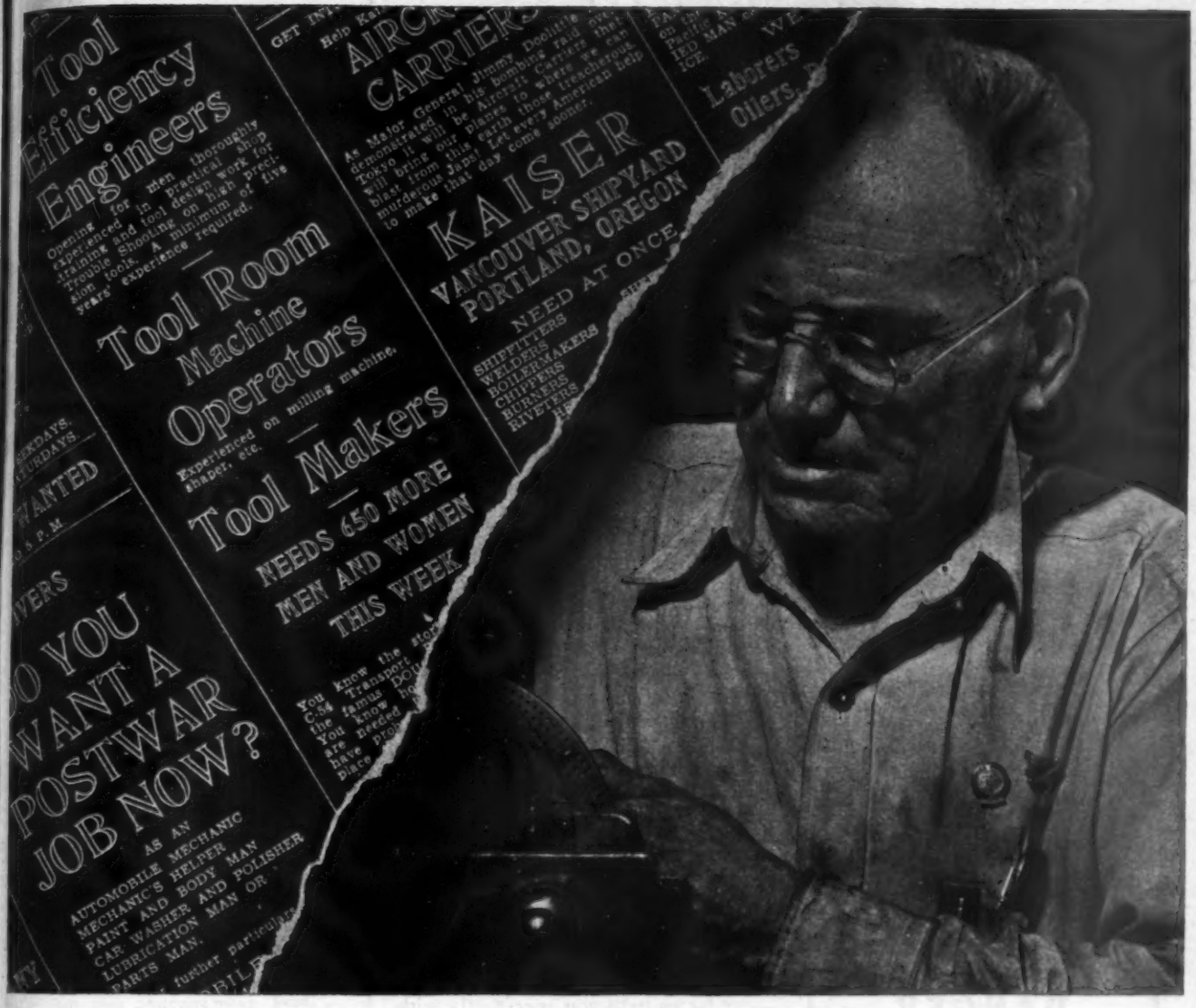
VERD-A-RAY

TECHNICAL DATA AND PRICE INFORMATION SHOULD BE IN YOUR FILES —ASK FOR IT—TODAY

A list of users in industry would look like "who's who" in war materiel production. Where glare exists, this new lamp is now accepted as a necessity. Try it. Technical data and sample will be sent without obligation to you.

SAVE ELECTRIC CORP.

TOLEDO 5, OHIO



Help Wanted!...

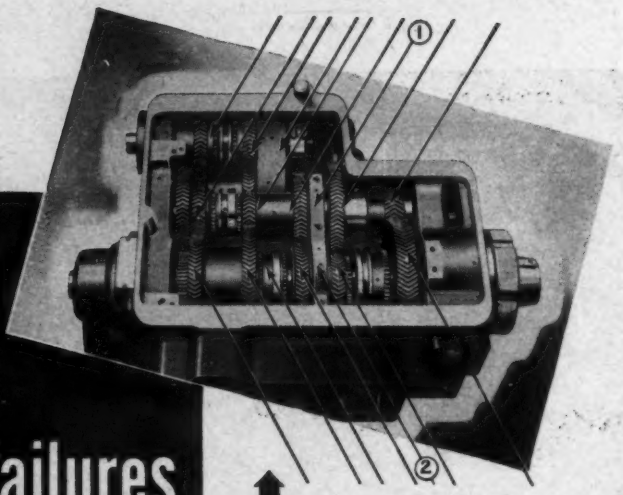
Today, the most competitive advertising in America is found in the want-ad sections of the daily newspapers. The search for more men and more women for production, continues. Section after section of the nation goes on the 48 hour week, in an effort to add more man-hours to the production front.

But there is another way—other than seeking more help—or working more hours. And that is, to increase the hourly productiveness of existing workers. This is being accomplished by thousands of plants by means of impressing each worker with his individual responsibility as a producing unit. It is being done by means of well planned, integrated programs produced by The Sheldon-Claire Company, an organization with a proven record* in many leading production plants of the United States and Canada.

THE SHELDON-CLAIRE COMPANY
520 NORTH MICHIGAN AVENUE • CHICAGO

Proven by service to PACKARD MOTOR CAR COMPANY, TRIUMPH EXPLOSIVES, INC., AMERICAN STEEL & WIRE COMPANY, AUTOMATIC SCREW MACHINE COMPANY, NEW DEPARTURE, JOSEPH T. RYERSON & SON, INC., CADILLAC MOTOR CAR COMPANY, *and thousands of others.*

Guarded against costly failures



Headstock of Sidney Lathe. Numerals 1 and 2 point to center bearings; other arrows indicate 14 Ampco bushings in the gears.

. . . with bushings and center bearings of wear-resisting Ampco Metal . . .

When you buy machine tools or other heavy equipment, it pays to look for parts of Ampco—the metal that stands up and gives several times the life of ordinary bronzes. Used by over 90 leading machine tool manufacturers.

Ampco is not an ordinary alloy, but a special metal produced by an engineering and research staff of metallurgical specialists under strict laboratory control, and applied with the cooperation of the national organization of Ampco Field Engineers. The range of Ampco grades provides unusual combinations of physical properties to resist wear, corrosion, shock, etc.

Send for bulletins which will aid you as a buyer and user of machinery — or let us help you specifically with your design problems. Write today.

For replacements

When you experience the failure of bronze parts—perhaps installed years before Ampco became widely known — replace them with Ampco. Ask nearest Ampco Field Engineer for suggested procedure and Ampco Metal stock list to meet the specific needs of your Maintenance Department.

Ampco Metallurgical Specialties

Ampco Metal (a special alloy of the aluminum bronze class) . . . Ampcoloy (general industrial bronzes) . . . Special Custom Copper-base Alloys.

• • •

Sand Castings . . . Centrifugal Castings . . . Extruded Products . . . Precision Machining . . . Ampco-Trode (coated aluminum bronze welding electrode) . . . Ampco Non-Sparking Safety Tools.

. . . Where a spark means DANGER industry relies on Ampco Non-Sparking Safety Tools

Standard safety equipment in ordnance plants, oil refineries, mines, on ships at sea. Tested and approved by insurance laboratories, often required to earn lowest insurance rates. Equip with Ampco. Over 400 standard tools — or "specials" when needed. Write today for Ampco Safety Tool Catalog.

Reg. U.S. Pat. Off.

AMPCO

Metal

The Metal without an Equal

Tear out and mail coupon today

AMPCO METAL, INC., Dept. FM-1 US-1
Milwaukee 4, Wisconsin

Please send ☐ File 41—Engineering Data Sheets
☐ Ampco Safety Tool Catalog
☐ Information on Maintenance Uses

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Company.....

Address.....

City.....(.....) State.....

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Featuring additional products and specialties for manufacturing plants

Automatic Control

POWERS TEMPERATURE and HUMIDITY CONTROL

For Industrial Processes, Heating and Air Conditioning Systems, Hot Water Heaters and Shower Baths. Write for Bulletins.

Offices in 47 Cities

2717 Greenview Ave., Chicago, Ill.

THE POWERS REGULATOR CO.

This
WHERE TO BUY
Section

supplements other advertising in this issue with these additional announcements of products and services essential to modern plant management and maintenance. Make a habit of checking this page, each issue.

DEPARTMENTAL STAFF
FACTORY
MANAGEMENT &
MAINTENANCE

DIAMONDS *for Victory*

"ANGLE-SET-MAGNET-BLOCK"

$25.00 *Complete* For Magnetic Chuck Grinding. Keep Surface grinder wheels in good order. A boon to tool and die makers. Comprises 3 units: Block — 2½x3x1, 12° "Angle-Set" and BIG-HED-NIB with No. 10-CNX Diamond Rotate top nib only to sharpen.

LOC-KEY-SET
RE-SET-ABLE
Write for No. 4 Catalog

DIAMOND TOOL COMPANY, Not Inc.
Sheldon M. Booth, Pres.
938 E. 41st Street CHICAGO, ILL.

KESTER FLUXES
are
44 Years Old
WRITE US
YOUR PROBLEM

KESTER
SOLDER COMPANY
4213 Wrightwood Avenue, Chicago, Illinois
Eastern Plant: Newark, N. J.
Canadian Plant: Brantford, Ont.

Est. 1878
ORANGEVILLE
Ask For CATALOG

ALL TYPES **FLOOR TRUCKS** WHEELS CASTERS

ORANGEVILLE MFG. CO.
Orangeville (Col. Co.) Penna.

SPRING BEARING
FEATURE ON "WELD-BILT"
PLATFORM TRUCKS
Saves: Time—Labor—Man—
Floors — Product Damage

WEST BEND EQUIPMENT CORP.
221 Water Street, West Bend, Wisconsin

INDUSTRIAL CONSULTANTS

Costs — Management — Inspections
Research — Accounting — Motion Studies

Consulting Services on Plant Management Problems

ASSOCIATED ENGINEERS, INC.
Management—Consultants
Engineering—Accounting
Organization—Methods—Costs
Old First Bank Building, Fort Wayne, Indiana

MITCHELL FEIN ASSOCIATES
Wage Incentives
Job Evaluation & Classification
Industrial Engineering
321 Fifth Avenue New York

CONSULTANTS
whose cards appear on this page merit your confidence by the offering of these special services nationally.

An Aide
to the Business Executive

The management consultant renders an invaluable type of service because he can devote himself exclusively and wholeheartedly to an assigned problem and is free from the routine demands of active management with which the business executive is daily confronted.

In essence, the consultant is a special aide to the busy administrator in augmenting and building a work-program of increased efficiency.

METHODS ENGINEERING COUNCIL
MOTION AND TIME STUDY INDUSTRIAL MANAGEMENT
INSTRUCTION CONSULTATIONS
TRAINING INSTALLATIONS
Wood and Franklin Streets, Station 21
Pittsburgh, Pa.

ALLAN H. MOGENSEN
Training in Work Simplification
330 W. 42nd Street
NEW YORK CITY

NORRIS & ELLIOTT, INC.
Management Engineers
WAGE INCENTIVES
JOB EVALUATION
MOTION-TIME STUDIES
COST & PRODUCTION CONTROL
Columbus, Ohio New York, N. Y. Boston, Mass.

LAURENCE SEMEL
Labor Relations Consultant
Wage & Hour Consultant
Representing employers exclusively
60 Park Place, Newark, N. Y.

SEARCHLIGHT SECTION

EMPLOYMENT • BUSINESS • OPPORTUNITIES • EQUIPMENT—USED or RESALE

UNDISPLAYED RATE:
10 cents a word, minimum charge $2.00. (See ¶ on Box Numbers.)
POSITIONS WANTED (full or part-time individual salaried employment only), ½ above rates.
PROPOSALS, 50 cents a line an insertion.

INFORMATION:
BOX NUMBERS in care of any of our New York, Chicago or San Francisco offices count 10 words additional in undisplayed ads.
DISCOUNT of 10% if full payment is made in advance of four consecutive insertions of undisplayed ads (not including proposals)

DISPLAYED—RATE PER INCH:
The advertising rate is $8.00 per inch for all advertising appearing on other than a contract basis. Contract rates quoted on request.
AN ADVERTISING INCH is measured ⅞ inch vertically on one column, 3 columns—30 inches—to a page. F.M.M.

NEW ADVERTISEMENTS received by 10 A. M. January 21st will appear in the February issue, subject to limitations of space available.

WANTED

MECHANICAL OR CHEMICAL ENGINEERS

Major oil company with nation-wide operations seeks *Mechanical or Chemical Engineers,* preferably college graduates, with experience in lubricating oils and their application to industry. Sales experience in this field will be helpful but not essential.

Such men can expect:

1. **A good future in work covering lubrication problems in industrial plants now primarily working on war equipment.**
2. **To participate in a training course presented by the employer.**
3. **To receive a good starting salary.**
4. **To have employment which will not be of a temporary nature.**

In reply state experience, education, age, marital status, draft classification and salary expected and include small snapshot (not returnable). Replies strictly confidential. If employed in essential war work, availability certificate required. If already working at your highest skill, do not apply.

P-672, Factory Management & Mainten. 330 W. 42nd St., New York 18, N. Y.

PLANT MANAGER

The man we need is thoroughly experienced in all phases of factory management as well as co-ordination, between factory and office, and can assume full responsibility. He knows production methods which result in the highest plant efficiency and can put them into effect in a very busy, constantly expanding cosmetic plant. He not only senses the need for changes but is quick to act. He schedules production to meet sales needs, can inspire employees to do the best job possible without antagonizing them. This is an outstanding opportunity for a man of unusual and tried ability. Not a war period job. Only letters giving complete details of education, previous employment, salaries earned and age will be considered.

Essential workers need release statement.

P-663, Factory Mgt. & Maintenance 330 W. 42nd St., New York 18, N. Y.

WANTED

MECHANICAL OR ELECTRICAL ENGINEER

with sufficient background and experience to take full charge of lay-out and installation of new rubber processing machinery and also to assume responsibility for plant and machinery maintenance in a medium sized tire factory. Excellent opportunity with assured postwar permanence in a growing company.

P-649, Factory Mgt. & Maintenance
520 N. Michigan Ave., Chicago 11, Ill.

WANTED

Electrical Engineer or Physicist

For research and development in U.H.F. and RADAR. Firm prominently established with exceptional post-war future. Liberal salary. Full details in first letter.

P-662, Factory Mgt. & Maintenance
330 West 42nd St., New York 18, N. Y.

WANTED

MECHANICAL ENGINEERS

Vegetable oil processing plant in Southwest wants a young experienced Mechanical Engineer to supervise mechanical service departments, and another to do engineering development and design.

P-653, Factory Manage. & Maint.
520 N. Michigan Ave., Chicago 11, Ill.

POSITIONS VACANT

PATENT DRAFTSMAN WANTED. Must be experienced in the art of making first class patent drawings. Excellent prospects for individual who can fit into heavy equipment development program. Give complete details of experience, salary expected and personal history in first letter. P-664, Factory Management & Maintenance, 330 W. 42nd St., New York 18, N. Y.

INDUSTRIAL ENGINEER — Old established company now reconverting to pre-war production (essential products) has opening for graduate industrial or mechanical engineer who is interested in following time study, motion time analysis, job evaluation, and general industrial engineering work as a profession. Experience desirable but not essential. If employed in war industry, statement of availability required. Give complete details of personal qualifications and work history in letter of application to P-665, Factory Management & Maintenance, 330 W. 42nd St., New York 18, N. Y.

POSITIONS WANTED

PRODUCTION CONTROL MAN—Experienced shop supervision; planning, scheduling, coordinating production. Draft deferred. PW-666, Factory Management & Maintenance, 330 W. 42nd St., New York 18, N. Y.

INDUSTRIAL RELATIONS DIRECTOR

now employed, experienced in dealing with male and female, white and colored help, in constant contact with various government departments; legal education and special training in personnel work; seeks greater opportunity; location unimportant. Write P. O. Box 107, Louisville, Ky.

SALARIED POSITIONS

This advertising service of 34 years' recognized standing negotiates for high salaried supervisory, technical and executive positions. Procedure will be individualized to your personal requirements and will not conflict with Manpower Commission. Retaining fees protected by refund provision. Identity covered and present position protected. Send for details.

R. W. BIXBY, INC.
276 Delward Bldg., Buffalo, N. Y.

MANUFACTURING EXECUTIVES and TECHNICAL MEN

Qualified men wanted for openings throughout the United States. Write for application, or submit experience record.
Inquiries solicited from responsible employers. All negotiations confidential. Est. 28 yrs.

HARRISON PERSONNEL SERVICE
20 W. Jackson Blvd. Chicago

Key Men For Industry

We offer an ethical personnel service to INDUSTRY as well as above average men in management, engineering and manufacturing who wish to improve themselves.

Curt E. Patton Personnel Eng'rs
53 W. JACKSON CHICAGO

EXECUTIVES AND TECHNICAL MEN

Be Ready for Post War Opportunities

We solicit inquiries from qualified candidates who desire to contact employers for positions paying up to $20,000 per year. Confidential. Est. 29 years.

(Inquiries from Employers entail no obligation)

THE NATIONAL BUSINESS BOURSE
20 W. Jackson Blvd., Chicago 4

POSITIONS WANTED

INDUSTRIAL ENGINEER qualified to act as Plant Manager, Assistant Plant Manager, Chief Industrial Engineer—22 years experience job evaluation, methods improvement, cost control, budgets, standards, factory lay-out, incentives, foreman training, industrial relations, supervision. Protestant. Employed. PW-658, Factory Management & Maintenance, 68 Post Street, San Francisco 4, Cal.

INDUSTRIAL ENGINEER, 10 years administrative experience with present employer, nationally known metal working concern in Pennsylvania, interested in making new connection, preferably in New England. Thorough experience in setting up Wage Incentive Plan, Budgetary Control System, Job Analysis and Production Control. Thirty-eight, American citizen, educated in Sweden and the United States. Only interested in complete charge of Standards and Methods Department or as assistant to executive officer. Available March first or sooner. PW-667, Factory Management & Maintenance, 330 W. 42nd St., New York 18, N. Y.

MAINTENANCE ENGINEER, 3AH draft class. All around pipeman, construction, pipe foreman, maintenance supervisor power engineering air conditioning, Powerhouses, chemical plants and oil refineries. Desires steady connection. Edwin E. Brabetz, 4101 Inez St., Beaumont, Texas.

SAFETY & INSURANCE EXECUTIVE available soon. Age 40. Twenty years broad experience includes industrial, fleet and public safety and claims, expert training in industrial hygiene, job training techniques, speaking. Interested in industrial relations. Excellent record. PW-671, Factory Management & Maintenance, 520 N. Michigan Ave., Chicago 11, Ill.

(Continued on opposite page)

WAGE INCENTIVES

HIGHER PRODUCTION—HIGHER WAGES LOWER COSTS

We are currently installing the NORRIS UNIT SYSTEM of wage incentives, cost and production control in a diversity of industries, including foundries, machine shops, miscellaneous metal trades, wire mills, paper products, textile plants, radio and electrical equipment, refineries, . . . covering almost every phase of war production.

We will gladly discuss our methods with you, without obligation on your part, either in person or by correspondence.

NORRIS & ELLIOTT, INC.

Member Association of Consulting Management Engineers

COLUMBUS, OHIO NEW YORK, N. Y. BOSTON, MASS.

YOU ARE ONE

of over 30,000 subscribers of FACTORY MANAGEMENT and MAINTENANCE.

Your problems of plant management, production and maintenance—business or individual—are duplicated with *other* readers BUT—

Still *OTHER* readers can provide the solution of your problem if they *know what it is!*

Tell them! Here! Through classified advertising in the Searchlight Section of "Factory"—*your* business paper and *theirs*.

APPLIED INDUSTRIAL TRAINING

Today's all-out production demands trained supervisors—foremen, time and motion study men who achieve results! Improve production methods . . . expert industrial consultants will train members of your organization, using courses based on your individual needs. Offered too are time and motion study courses designed for home study—Write us regarding your needs.

Methods Engineering Council
Wood and Franklin Streets
Pittsburgh (21) Pa.

BUY THIS POSTWAR BUSINESS

READY TO GO!

ATTENTION — Operators of any well-equipped machine shop needing a main postwar product. Here is an opportunity of a lifetime! Buy this successful business at an approximate cost of inventory figure. Due to our having a large quantity of production work that will occupy our entire plant, we are offering for sale the complete manufacturing facilities of a popular type machine tool. This machine is of a superior design and always in demand. It has been widely advertised and there are hundreds in service. Now finishing up the last order. Have a backlog of inquiries for $150,000.00 worth of new business. The potential demand is tremendous. The entire business can be purchased for practically the cost of the inventory, with no charge for goodwill or other intangibles. This would include drawings, patterns, fixtures, special tools and spare parts for replacements. The replacement and repair work alone, should be worth the price asked.

Will stand investigation.

BO-673, Factory Mgt. & Maintenance
520 N. Michigan Ave., Chicago 11, Ill.

POSITIONS WANTED
(Continued from opposite page)

INDUSTRIAL MANAGER: 20 years in precision machining, stampings, foundry. Nine years in charge of operations AAAi company. Long practical experience; machines, methods, cost reduction, labor control, product engineering, purchasing, personnel, job rating and evaluation, master mechanic. Will deliver the results you want, save own compensation many times. Age 48. Protestant. Principal Address: PW-655, Factory Management & Maintenance, 520 N. Michigan Ave., Chicago 11, Ill.

INDUSTRIAL ENGINEER — Married—3B—14 years experience installing and administrating Wage Incentive plans. Individual and group. 12 years with large chemical company. Experience includes equipment, design, methods, time-study, wage incentives. Now Time-Study Supervisor. Desires executive or supervisory position with reputable large company engaged in War work which normally has basic peace-time business. Minimum salary $7000-$7500. PW-669, Factory Management & Maintenance, 520 N. Michigan Ave., Chicago 11, Ill.

INDUSTRIAL ENGINEER—Top notch results in production control, organization, standards, methods, incentives, industrial relations. Now, at 32 years, supervising broad industrial engineering program in factory with 1000 employees. Especially successful in coordinating plant activities, reducing cost, and handling people. Master's Degree. Draft deferred. PW-670, Factory Management & Maintenance, 330 W. 42nd St., New York 18, N. Y.

GENERAL WORKS MANAGER. Are you having difficulty meeting your production schedule? Are your costs too high? Manufacturing executive with excellent record of producing medium and light precision type machines and devices mechanical and electrical, seeks connection with established concern having post war program. Thoroughly experienced in directing purchasing, engineering, planning, tooling, machining, erecting, assembling and all manufacturing activities. Available Jan. 1st. PW-668, Factory Management & Maintenance, 330 W. 42nd St., New York 18, N. Y.

ELECTRICAL MAINTENANCE MAN, 34, technical education, studied Safety Engineering, 13 years in chemical industry in electrical maintenance with some construction experience. At present head of maintenance crew of seven. Desires opportunity for wider use of ability. Available reasonable notice. Assoc. A.I.E.E. PW-674, Factory Management & Maintenance, 330 W. 42nd St., New York 18, N. Y.

BUSINESS OPPORTUNITY

EXPORT TO GREAT BRITAIN. For those who wish to make arrangements now to satisfy post-war demands. Well established financially very sound London firm of Importers and Wholesale Distributors to the Grocery, Provision, Ironmongery, Hardware and Allied trades also Co-operative Societies whose 30 travellers cover every county of England, Scotland, Wales and Ireland is open to entertain serious offers from substantial manufacturing firms, Exporters and producers with a view to sole distributions. First class references available. Write Box 358, Frederick Aldridge Ltd., 30 Bouverie Street, London, E. C. 4.

FOR SALE

TIME STUDY AND STANDARD COST FORMS —Engineered to fit your needs. Write for samples. Oznam Products, 5542 S. Homan, Chicago 29.

WANTED

ANYTHING within reason that is wanted in the industry served by Factory Management & Maintenance can be quickly located through bringing it to the attention of thousands of men whose interest is assured because this is the business paper they read.

MANUFACTURING FACILITIES
in England

North of England General Engineering Firm, employing 250, wish to contact American company desirous of securing manufacturing facilities in Britain. Facilities include grey iron castings from 56 lbs. to 5 tons, welded fabricated platework up to 10 tons machine shop with heavy Lathes, Planers and Boring Machines suitable for heavy manufacturing plant.

BOX 300, c/o T. B. BROWNE, Ltd.
551 Fifth Ave. New York, N. Y.

VALVES

INDUSTRIAL & MARINE

METROPOLITAN
PLUMBING SUPPLY CO., INC.
Power Plant Valves and Engineering Specialties for Oil, Steam, Gas, Air, Liquids and Chemicals.
Jenkins, Fairbanks, Sarco, Powell Valves and surplus.
Large Complete Stocks ⅛" to 24"
313 EAST 31st ST., NEW YORK CITY
For Hourly Nation-wide Shipments
CALL MUrray Hill 3-3408

CRETON PIPE & FITTINGS

COLD ROLLING MILLS

1—Standard Mill • 2—Broden Mills

Drives by DC Variable Speed Motors through gear reducers. Rolls 8" diameter, 5" face, water cooled and roller sleeve bearings. Motors 15-20 H.P., 230 volts, 500 to 1500 RPM, variable speed.

All mills equipped with one take-up for each two mills. Also all mills equipped with edge rolls. All in first class operating condition.

THE SENECA WIRE & MFG. CO.
Fostoria, Ohio

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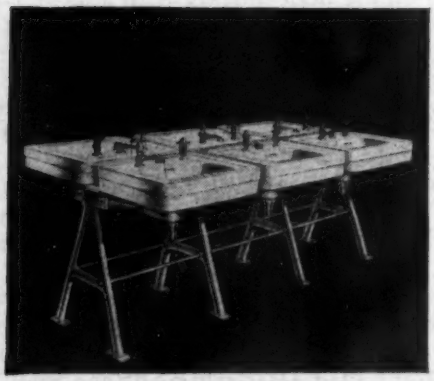

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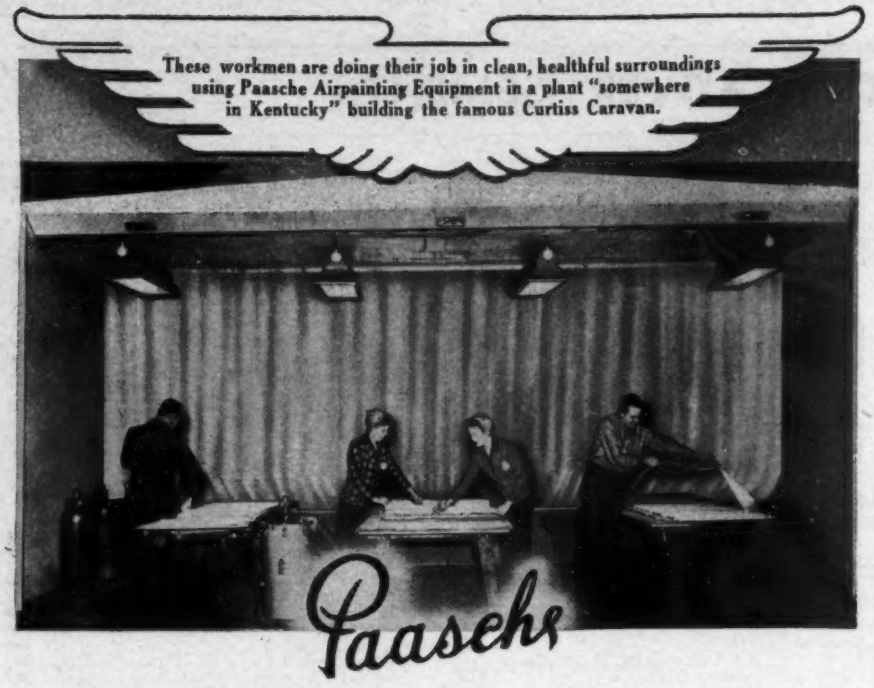

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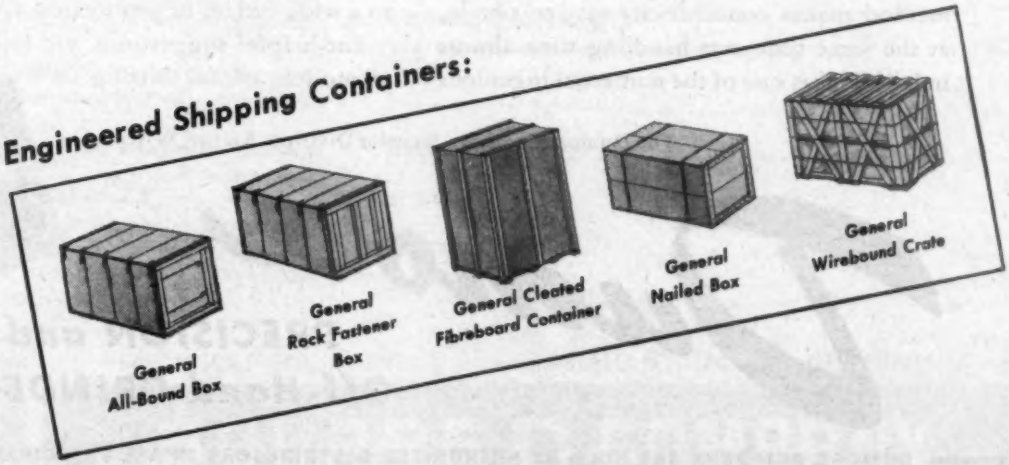

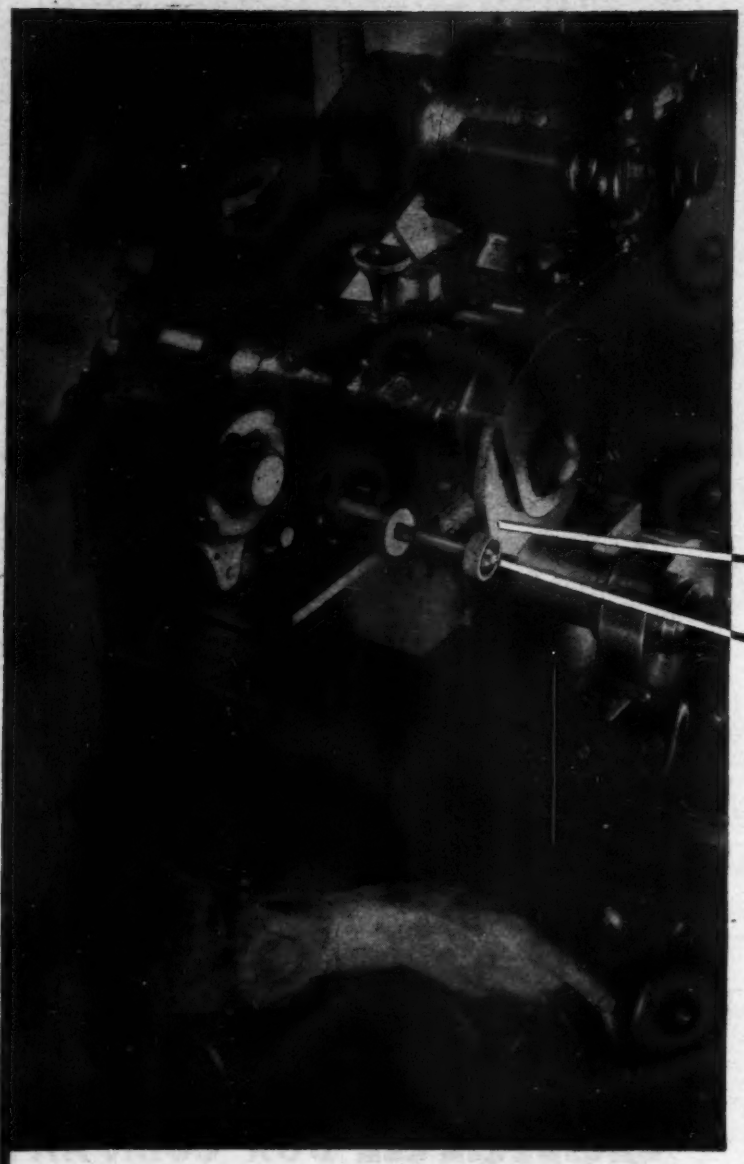

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for external and internal grinding!

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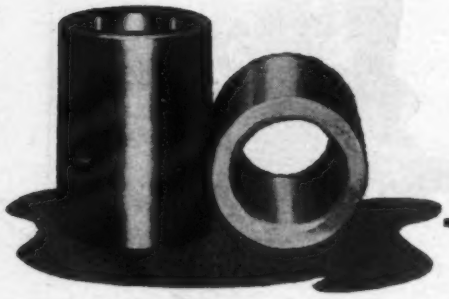

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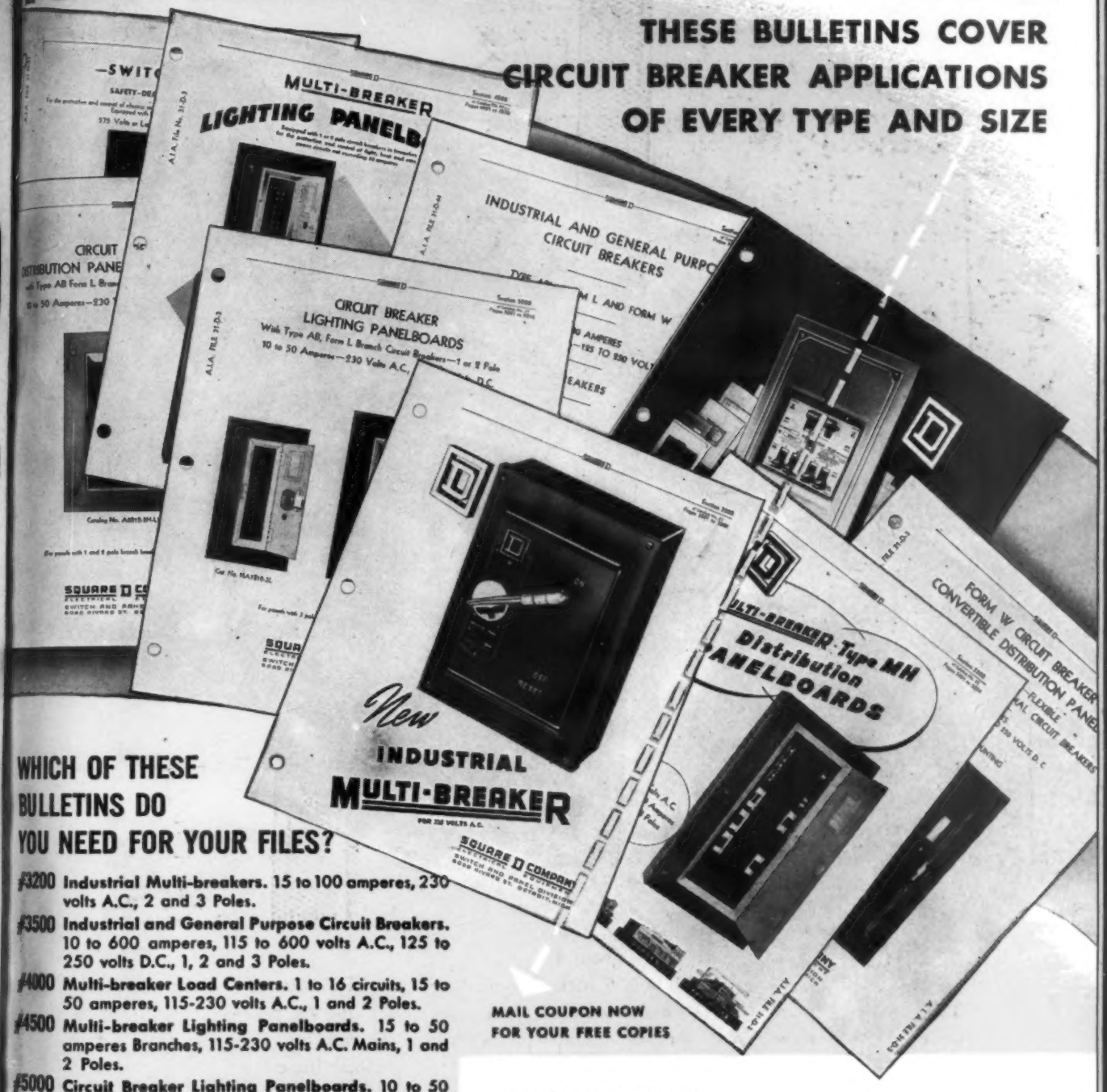
FOR YOUR REFERENCE FILES

THESE BULLETINS COVER CIRCUIT BREAKER APPLICATIONS OF EVERY TYPE AND SIZE



WHICH OF THESE BULLETINS DO YOU NEED FOR YOUR FILES?

#3200 **Industrial Multi-breakers.** 15 to 100 amperes, 230 volts A.C., 2 and 3 Poles.

#3500 **Industrial and General Purpose Circuit Breakers.** 10 to 600 amperes, 115 to 600 volts A.C., 125 to 250 volts D.C., 1, 2 and 3 Poles.

#4000 **Multi-breaker Load Centers.** 1 to 16 circuits, 15 to 50 amperes, 115-230 volts A.C., 1 and 2 Poles.

#4500 **Multi-breaker Lighting Panelboards.** 15 to 50 amperes Branches, 115-230 volts A.C. Mains, 1 and 2 Poles.

#5000 **Circuit Breaker Lighting Panelboards.** 10 to 50 amperes Branches, 125-250 volts A.C. or D.C. Mains, 1 and 2 Poles.

#5200 **Multi-breaker Type MH Distribution Panelboards.** 15 to 100 amperes Branches, 230 volts A.C. Mains, 1, 2 and 3 Poles.

#5300 **Square D Type ABH Circuit Breaker Distribution Panelboards.** 10 to 50 amperes Branches, 230 volts A.C., 125 D.C. Mains, 2 or 3 Poles.

#5500 **Square D Form W—Circuit Breaker *Convertible* Distribution Panelboards.** 15 to 600 amperes Branches, 600 volts A.C., 250 volts D.C. Mains, 1, 2 or 3 Poles.

#3000 **Square D Switchboards.** 575 volts A.C. or D.C.

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SQUARE D COMPANY
6060 Rivard Street, Detroit 11, Michigan FM-1

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TIMKEN BEARINGS

keep factory traffic moving

In shop trucks, conveyor systems, cranes or material-handling equipment of any kind, Timken Tapered Roller Bearings exert their multiple benefits to increase speed, save power, reduce maintenance and extend equipment life. These benefits are friction elimination; radial, thrust and combined load capacity; retention of moving parts in correct and constant alignment; they have their source in scientific bearing design; Timken Alloy Steel, and our many years of specialized engineering experience.

Timken Bearings are used on both drive axles of the Elwell-Parker Type F-9 Coil Handling Truck shown in the photograph, which has a maximum capacity of 20,000 pounds. This not only makes the truck *run easier,* but also *steer easier;* for when the truck is loaded most of the pressure is on the axle nearest the load; but when the truck is empty, due to the tremendous counterweights on the rear, the pressure is all on the rear wheels which, in this and most heavy-duty trucks are the steerable wheels; it is then that Timken Bearings function to the greatest advantage.

It will pay you to make sure you have them in any new equipment you buy. The more Timken Bearings there are in any piece of equipment the better it will perform, the longer it will last and the less it will cost for operation and maintenance. The Timken Roller Bearing Company, Canton, Ohio.

Don't let post-Victory competition catch you off balance. Prepare for it now by redesigning your product to use more Timken Bearings.

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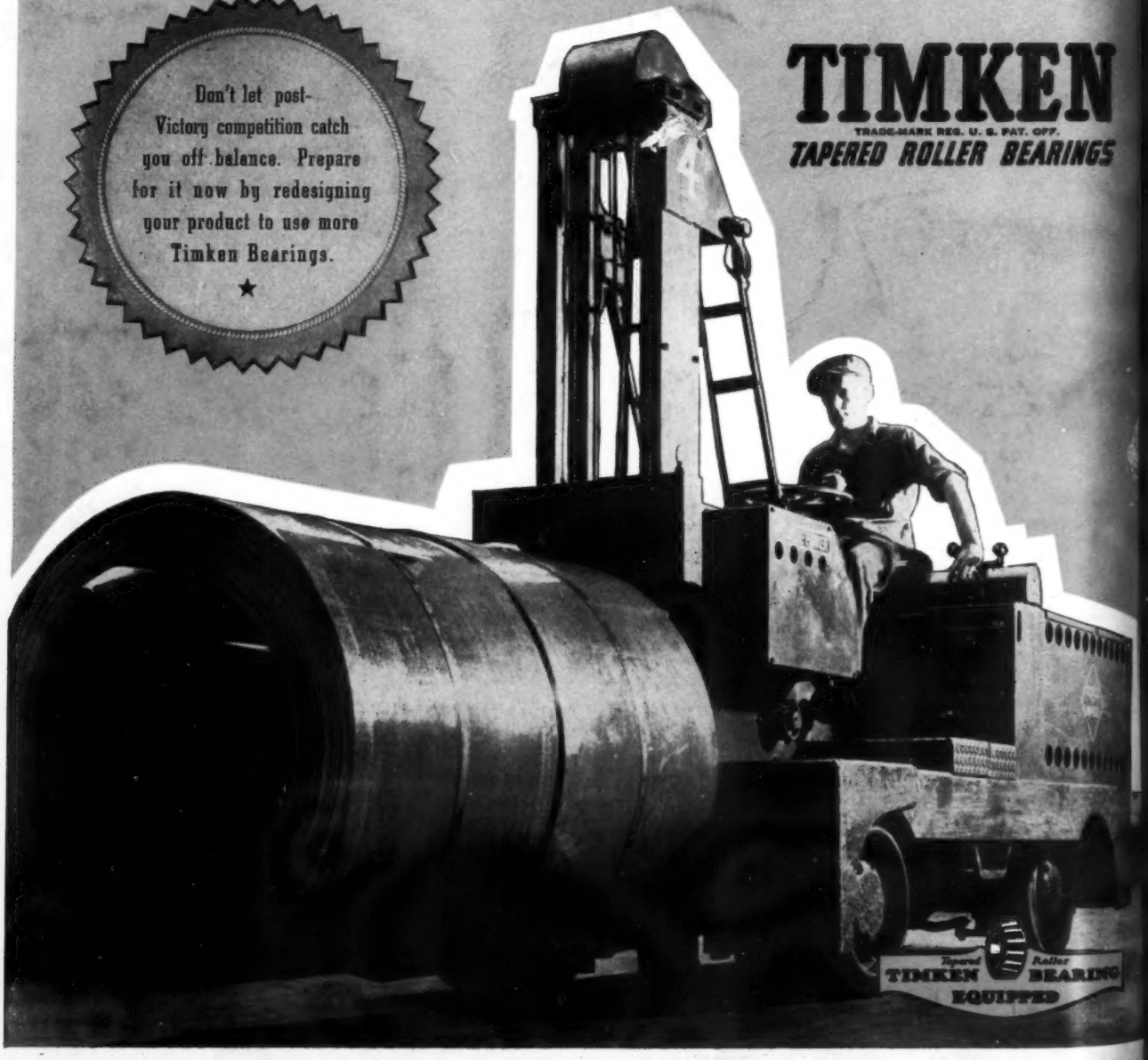
TAPERED ROLLER BEARINGS